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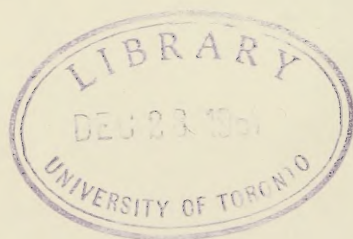
I
INTERNATIONAL SEISMOLOGICAL SUMMARY

for 1918 - 1922

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Oxford
University Observatory

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1918-22



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The International Seismological Summary for 1918.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

This Summary is the continuation of work done in recent years, first at Shide and then at Oxford, but is given a new title in consequence of a resolution of the Seismological Section of the International Union of Geodesy and Geophysics, at its meeting in Rome in May, 1922. At that meeting Professor Rothé, of Strasbourg, was appointed Secretary to the Section, Professor Oddone, of Rome, Vice-President, and Professor Turner, of Oxford, President. The Central Bureau of the Section was, on the motion of the President, placed at Strasbourg, under M. Rothé; but, in moving the resolution, the President expressed the hope that the work of collation of observations, which was already in full swing at Oxford, would not be interrupted, and the Section approved this course. It was, however, suggested by Professor Agamennone that after the completion of the work for the year 1917, already well advanced, the publication should be under the auspices of the Section, instead of, as before, under those of the Seismological Committee of the British Association, and this suggestion was approved. An annual sum of 10,000 francs was voted by the Section towards the expenses of computation and printing. It would only cover part of these expenses, but no more was available at the time.

This Summary may therefore be regarded as the lineal successor of the following publications:—

(a) The Shide circulars (Nos. 1-27) for the years 1899-1912, issued by John Milne from the Shide Observatory. These circulars give simply the records of each observatory without any attempt to collate one with another, except that records which had nothing corresponding at any other observatory were generally struck out. To ascertain this correspondence, or the failure of it, a large ledger was kept by Milne, and ultimately epicentres were determined for those shocks which this ledger shewed to be observed at several observatories. These determinations were published in (b).

(b) The Reports of the Seismological Committee to the British Association, of which Milne was Secretary, give epicentres and times as follows:—

16th Report (Portsmouth, 1911) gives details for 1899-1903.

17th Report (Dundee, 1912) gives details for 1904-1909.

18th Report (Birmingham, 1913) gives details for 1910.

(γ) There seem to be some periodicities in the recurrence of Earthquakes.

One of 21min. has been followed extensively, first as regards the earth generally (27th Report to B.A., Hull, 1922), next as regards shocks noted in Jamaica (G. Supt. to MN No. 2, p. 48), and at present under discussion are a long series of Italian earthquakes. As the work has progressed successive corrections to the period have been suggested, and since finality has not yet apparently been reached no precise figures need be given here. One reason for these corrections is that there is a swing of the maximum in a period close to four years at any one place. This four-year period seems also to affect the actual frequency of earthquakes in a given neighbourhood, apart from its effect on the epoch of the 21min. periodicity. The maximum frequency appears to travel round the earth from East to West in eight years, so that at any one time there are maxima on opposite sides of the earth; but the investigation is not yet completed. The accumulation of more and better material will tend to elucidate these matters.

H. H. TURNER.

University Observatory, Oxford,
February 27, 1923.

1918 JANUARY, FEBRUARY, & MARCH.

Jan. 1d. 15h. 2m. 10s. Epicentre 38°·0N. 23°·5E. (as on 1914 Oct. 17d. 6h.)

	Δ	P.	O - C.	L.	M.
	\circ	m. s.	s.	m.	m.
Athens	0·2	e 0 4	+1	0·6	0·8
Zagreb	9·6	e 2 32	+8	—	6·0
Helwan	10·4	8 50	?L	(8·8)	—
De Bilt	19·0	—	—	e 10·8	—

Jan. 1d. Records also at 0h. (San Fernando and Eskdalemuir), 7h. (Mizusawa), 12h. (La Paz).

Jan. 2d. Records at 3h. (Algiers), 4h. (De Bilt, Bidston, Rio Tinto, La Paz, and Helwan), 7h. (Helwan), 10h. (La Paz), 18h. and 19h. (Batavia), 20h. and 21h. (Monte Cassino), 23h. (Manila).

Jan. 3d. Records at 0h. (Lick and Eskdalemuir), 4h. (Port au Prince), 6h. and 8h. (Helwan), 13h. (Zi-ka-wei, Manila (3), Bombay, Edinburgh, and Colombo), 14h. (Eskdalemuir, Zagreb, Bidston, and Manila (2)), 15h. (Manila (2)), 16h. (Manila and Harvard), 17h. (Manila (2)), 18h. (Manila (2)), 19h. and 20h. (Manila), 22h. (Manila (3)).

1918. Jan. 4d. 4h. (I) 30m. 5s.)
(II) 32m. 25s.) Epicentre 10°·5N. 91°·0W.

A = -·017, B = -·983, C = +·183; D = -1·000, E = +·017;
G = -·003, H = -·183, K = -·983.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	\circ		m. s.	s.	m. s.	s.	m.	m.
II Balboa Heights E.	11·4	97	3 11	+21	—	—	6·6	7·9
II Tacubaya N.	11·4	97	3 19	+29	—	—	6·7	—
I Vieques	11·9	319	e 2 33	-25	—	—	—	—
I Tucson	25·9	70	e 6 48	?PR ₁	—	—	—	—
I Cheltenham	28·5	323	e 6 49	+36	12 15	+67	e 15·9	17·3
I Georgetown	30·9	22	—	—	12 53	+63	e 16·5	17·6
I Washington	31·0	21	e 6 57	+19	12 26	+35	e 16·3	—
I Ann Arbor	31·0	21	8 20?	?	13 0	+69	15·7	—
I Ithaca	32·4	10	6 49	-45	13 7	+11	16·7	18·9
I Toronto	34·3	19	—	—	—	—	e 16·8	—
II	34·7	15	—	—	—	—	e 17·5	—
II La Paz	34·7	15	—	—	—	—	e 17·0	18·3
I Harvard	35·2	140	i 7 38	+23	i 13 34	+36	18·7	19·3
I Northfield	36·3	25	7 9	-15	12 51	-23	e 16·9	19·6
I Ottawa	37·2	22	—	—	e 12 55	-32	e 18·9	—
II Lick	37·3	18	—	—	e 13 39?	+11	18·9	—
II Berkeley	38·3	319	e 7 55	+15	—	—	—	—
I Victoria	39·1	319	e 8 9	+22	—	—	—	21·3
II Honolulu	46·5	331	—	—	15 56?	+21	20·0	33·0
II Coimbra	64·9	289	e 19 35	?S	(19 35)	+11	e 31·9	34·9
II Rio Tinto	77·7	50	7 35?	?	21 35?	-22	41·3	43·5
II San Fernando	79·2	53	24 35	?S	(24 35)	+141	—	53·6
II Eskdalemuir	79·6	55	24 5	?S	(24 5)	+106	43·6	50·1
I Edinburgh	80·1	35	12 12	-8	22 13	-11	36·6	46·6
II Bidston	80·1	35	21 35	?S	(21 35)	-49	(33·3?)	51·9
II Granada	80·3	37	11 35	-46	22 47	+20	—	47·3
I Kew	81·6	53	12 13	-15	22 5	-37	—	—
II Paris	82·2	39	—	—	—	—	—	49·9
II De Bilt	84·4	41	—	—	e 22 39	-33	39·6	47·6
II Uccle	84·9	38	—	—	e 22 47	-31	34·6	49·3
I Barcelona	85·2	39	e 12 29	-20	—	—	e 40·6	—
II Rocca di Papa	85·3	49	—	—	—	—	41·0	49·9
II Vienna	93·0	47	—	—	(e23 53)	-52	23·9	56·2
II Zagreb	93·4	40	e 13 12	-22	—	—	—	—
II Helwan	94·0	42	e 13 14	-24	e 24 15	-41	45·6	56·6
II Mauritius	94·0	42	i 13 20	-18	e 24 11	-45	—	50·6
II Melbourne	111·4	52	28 35	?S	(28 35)	+54	—	—
I Mauritius	123·2	231	—	—	—	—	e 62·6	68·5
I Mauritius	148·6	112	—	—	—	—	70·5	78·7

For Notes see next page.

NOTES TO JAN. 4d. 4h. (i) 30m. 5s. (ii) 32m. 25s.

Additional records: Tucson MN = +17.1m., LN = +10.4m. Vieques
eLN = +12.2m., MN = +18.0m. Cheltenham LN = +15.9m., MN =
+17.0m. Ann Arbor SN? = +13m.37s., MN = +19.9m., PE = +6m.7s.,
SE = +12m.25s., LE = +14.6m., M = +18.9m. Toronto (ii) Li = +17.6m.
La Paz RP = +9m.10s., M = +20.8m. Harvard T₀ = 4h.29m.55s.
Ottawa eLN = +16.4m., LN = +23.9m. Victoria L = +26.3m. Coimbra
L = +38.6m. San Fernando S = +35m.5s., MN = +49.1m. De Bilt
MN = +35.7m. Rocca di Papa MN = +90.4m. Zagreb T₀ = 4h.32m.50s.

1918. Jan. 4d. 15h. 48m. 45s. Epicentre 6°5S. 153°5E.

(as on 1913 Sept. 3d. 20h.).

A = -.889, B = +.443, C = -.113; D = +.446, E = +.895;
G = +.101, H = -.051, K = -.994.

	△	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Sydney	27.4	184	10 51	?S	(10 51)	+ 3	14.5	16.4
Riverview	27.4	184	i 6 8	+ 6	i 10 51	+ 3	e 14.6	16.2
Melbourne	32.3	193	—	—	12 3	-10	17.2	20.2
Manila	38.5	303	e 7 37	- 5	—	—	—	—
Batavia	46.4	268	e 8 15	-28	—	—	—	—
Zi-ka-wei	48.7	323	e 8 59	+ 1	—	—	—	—
Honolulu	55.1	58	e 15 3	?	e 20 9	?SR ₁	e 23.0	32.4
Berkeley	89.4	52	—	—	e 30 19	?SR ₁	—	—
Victoria	90.5	41	37 28	?	—	—	46.3	50.2
Mauritius	93.8	250	40 39	?L	—	—	(40.6)	48.8
Toronto	120.8	42	—	—	—	—	e 66.6	75.2
Helwan	121.0	301	31 15	?	—	—	—	—
Edinburgh	127.3	344	56 15	?L	—	—	(56.2)	87.2
De Bilt	127.5	336	—	—	—	—	59.2	62.3
Bidston	129.4	342	—	—	—	—	—	51.2
La Paz	132.8	120	e 19 37	[+12]	—	—	67.4	72.2

Additional records: Riverview PS = +11m.16s., MN = +16.1m., MZ =
+24.0m., T₀ = 15h.48m.56s. Perth (△ = 43°3) records merely
16h.3m.50.5s. to 17h.8m.58.2s. De Bilt MN = +65.3m. Eskdalemuir
(△ = 127°8) records 16h.30m. to 17h.30m.

Jan. 4d. Records also at 0h. (Zagreb), 1h. (Manila (2)), 3h. (Manila), 4h. (Tacubaya), 5h. (La Paz), 6h. (Colombo and Manila (2)), 7h. (Manila (2)), 8h. (Helwan), 11h. (Manila), 13h. (Algiers), 14h. (Manila), 17h. (Manila and Paris), 19h. (Manila and La Paz).

Jan. 5d. Records at 1h. (La Paz), 5h. (Helwan), 7h. (La Paz), 8h. (Helwan), 13h. (Monte Cassino, Helwan, and Manila), 14h. (Manila), 19h. (Helwan, Zagreb, Pola, and La Paz), 21h. (Monte Cassino), 23h. (Manila).

Jan. 6d. Records at 1h. (Manila), 7h. and 14h. (Helwan), 16h. (La Paz and Simla), 21h. (Taihoku), 22h. (Zurich).

Jan. 7d. Records at 4h. (Colombo), 5h. (Edinburgh), 13h. (Algiers), 18h. (Manila and Melbourne), 22h. (Taihoku and Zi-ka-wei), 23h. (Helwan).

Jan. 8d. Records at 0h. (Taihoku), 9h. (Balboa Heights), 10h. (Monte Cassino), 13h. (Helwan), 14h. (Edinburgh), 18h. (La Paz).

Jan. 9d. Records at 3h. (Taihoku and Zi-ka-wei), 4h. (San Fernando and Helwan), 5h. (La Paz), 6h. (Athens), 7h. (Zi-ka-wei), 11h. (Batavia), 19h. (San Fernando).

Jan. 10d. Records at 6h. (Mizusawa), 7h. (Zagreb), 8h. (Algiers), 9h. (Athens, Manila, and Rocca di Papa), 13h. (Manila), 16h. (Colombo), 19h. (La Paz).

Jan. 11d. Records at 1h. (La Paz), 3h. (Colombo), 4h. (Helwan and Colombo), 6h. (Colombo), 7h. (La Paz), 12h. (Riverview and Marseilles), 15h. (Colombo), 17h. (La Paz).

Jan. 12d. 18h. 38m. 30s. At $11^{\circ}5'N$, $144^{\circ}0'E$. (as on 1917 May 9d. 15h.).

A = -793, B = -576, C = +199; D = -588, E = +809;
G = -161, H = +181, K = -980.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Manila	22.7	280	—	—	—	—	e 13.2	—
Zi-ka-wei	28.7	317	e 6 17	2	e 10 37	-35	—	—
Batavia	41.0	247	—	—	e 13 54	-27	—	—
Riverview	15.8	172	e 9 0	-21	e 15 6	-19	e 17.3	25.1
Melbourne	19.3	180	16 36	?S	(16 36)	-26	23.5	26.0
Honolulu	56.2	72	—	—	e 15 54	-102	—	26.5
Helwan	103.2	304	26 30	?S	(26 30)	-4	—	—
Zagreb	106.2	325	e 21 48	?PR ₁	i 21 56	?PR ₁	—	—
Edinburgh	107.3	342	76 30	?L	—	—	(76.5)	85.5
Uccle	108.5	334	21 23	?PR ₁	—	—	—	—
Bidston	109.3	340	56 32	?L	66 12	?	(56.5)	91.5
Rocca di Papa	110.5	323	e 20 24	?PR ₁	—	—	—	22.6
Moncalieri	111.1	328	e 20 47	?PR ₁	—	—	—	—

Additional records: Riverview eP? = +7m.18s., i = +10m.31s., +10m.37s., +11m.19s., MN = +18.5m. These records are given at 19h. instead of 18h.

Jan. 12d. Records also at 2h. (Colombo (2)), 3h. (Helwan and Colombo), 4h. and 6h. (Taihoku), 10h. (Manila), 12h. (Zi-ka-wei, La Paz, and Melbourne), 18h. (La Paz and Manila), 19h. (Manila), 22h. (Helwan), 23h. (La Paz, Georgetown, Victoria, Harvard, and Toronto).

Jan. 13d. 8h. 2m. 0s. Epicentre $27^{\circ}0'S$, $172^{\circ}0'W$. (as on 1917 May 4d.).

A = -882, B = -124, C = -454.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Apia	13.2	0	e 3 31	-15	—	—	4.8	—
Riverview	32.3	248	e 6 42	-9	e 12 18	+5	e 14.8	18.4
Sydney	32.3	248	11 48	—	(11 48)	-25	16.2	17.5
Melbourne	37.6	242	—	—	13 42	+10	20.5	22.4

Jan. 13d. Records also at 0h. (Ottawa, Toronto, Washington, and Northfield), 2h. (Colombo, Harvard, and Simla), 5h. (Mizusawa), 11h. (Moncalieri and Milan), 12h. (Zagreb, Milan, Zurich (2), and Moncalieri (2)), 21h. (Kobe), 23h. (Harvard, Georgetown, and Athens (2)).

Jan. 14d. 6h. 44m. 40s. Epicentre $43^{\circ}5'N$, $11^{\circ}8'E$.

A = +710, B = +148, C = +688.

	Δ	P.	O-C.	S.	O-C.	L.	M.
		m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	1.9	e 1 4	?S	(e 1 4)	+11	—	2.8
Pola	2.0	i 1 4	?S	(i 1 4)	-8	e 1.9	2.0
Zagreb	3.3	e 0 49	-3	1 29	-2	—	1.6
Zurich	E. 4.5	i 0 54	+1	1 32	+1	—	2.3
	N. 4.5	e 2 10	?S	(2 10)	-6	(3.7)	—
		e 2 8	?S	(2 8)	+4	(3.7)	—

Zagreb gives also iNW = +0m.58s. Zurich S taken as L.

Jan. 14d. 20h. 2m. 36s. At $44^{\circ}0'N$, $20^{\circ}0'W$. (as on 1917 June 16d. 12h.).

A = +676, B = -246, C = +695; D = -342, E = -940;
G = -653, H = -238, K = -719.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Coimbra	9.4	110	—	—	(e 4 24)	-11	—	—
San Fernando	13.0	121	1 54	?	—	—	11.6	13.4
Bidston	14.5	44	4 6	+33	10 36	?	—	15.9
Tortosa	14.8	95	6 28	?S	(6 28)	+1	14.0	21.0
Stonyhurst	15.1	43	—	—	—	—	—	16.2
Kew	15.1	54	—	—	—	—	—	25.4
Edinburgh	16.0	36	11 44	?L	—	—	(11.7)	—
De Bilt	18.5	55	e 5 13	+50	—	—	12.4	18.2
Moncalieri	19.7	78	e 4 33?	-4	7 20?	?	11.5	—
Rocca di Papa	23.9	84	—	—	—	—	e 20.5	21.7
Helwan	42.6	91	11 24	?	—	—	—	—

Additional records: San Fernando MN = 13.9m. Tortosa S = -9m.46s.
Stonyhurst says that the phases are lost in tremors. De Bilt M = -25.3m.

Jan. 14d. Records also at 0h. (Helwan), 2h. (Athens), 3h. (Athens and Colombo), 4h. (La Paz and Harvard (2)), 7h. (Harvard), 13h. (Mizusawa), 14h. (Stonyhurst), 17h. and 19h. (La Paz), 21h. (San Fernando).

Jan. 15d. 15h. 29m. 6s. Epicentre 25°0'N. 119°5'E. (as on 1915 Jan. 5d. 23h.).

A = -446, B = +789, C = +423; D = +870, E = +492;

G = -208, H = +368, K = -906.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.9	89	0 29	0	—	—	0.8	0.9
Zi-ka-wei	6.4	15	e 1 37	- 1	—	—	—	—
Manila	10.5	172	e 2 44	- 7	6 6	?L	(6.1)	9.3
Osaka	16.8	51	—	—	7 15	- 2	—	11.8
Riverview	66.1	152	—	—	e 23 54	?SR ₁	—	38.4
Honolulu	71.7	73	—	—	—	e 35.5	—	43.9
Helwan	76.3	297	17 54	?L	—	—	(47.9)	—
De Bilt	81.1	326	—	—	—	e 45.9	—	56.3
Edinburgh	85.7	332	17 54	?L	—	—	(47.9)	57.9
Eskdalemuir	86.0	331	—	—	—	—	44.9	—
Kew	87.1	327	—	—	—	—	—	57.9
Bidston	87.2	330	46 59	?L	—	—	(47.0)	58.0

The Osaka records are given as 16h. They are included in this table because they fit so well when corrected by -1 hour.

Additional records: Manila L = +8.3m., MN = +8.7m., T₀ = 15h.27m.9s.
Osaka MN = +12.1m. Riverview MN = +37.2m. De Bilt M = +56.2m.

There appears to have been a subsequent shock at 57m.34s., felt and recorded at Taihoku and Zi-ka-wei: Taihoku P = +0m.29s., L = +0.8m., M = +0.9m. (O-C. = 0s.). Zi-ka-wei eS = +2m.21s. (O-C. = -33s.).

Jan. 15d. Records also at 4h. (La Paz), 5h. (Batavia), 8h. (Taihoku), 19h. (Manila), 23h. (La Paz and Harvard).

Jan. 16d. 2h. 33m. 5s. Epicentre at (roughly) 1°5'N. 110°0'E.

A = -342, B = +939, C = +026; D = +940, E = +342;

G = -009, H = +025, K = -1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	8.3	202	e 2 4	- 2	—	—	—	5.9
Manila	17.0	39	e 4 3	- 2	—	—	—	—
Riverview	52.4	136	—	—	e 12 49	?PR ₁	e 21.1	24.7
Melbourne	50.8	144	—	—	19 1	?	23.0	25.4
Helwan	79.4	300	50 55	?	—	—	—	—
La Paz	164.9	187	20 15	[- 3]	—	—	—	—

Riverview MN = +25.9m. The Australian stations do not suit this epicentre, and are discordant; indeed the whole material is defective.

1918. Jan. 16d. 7h. 13m. 15s. Epicentre 37° 4N. 30° 5E.

A = +.684, B = +.403, C = +.607; D = -.508, E = -.862;
G = +.523, H = +.308, K = -.794.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	m.	s.	m. s.	s.	m. s.	s.	m.	m.
Athens	5.4	278	e 1 23	0	2 24	- 4	2.9	4.0
Pompeii	12.8	290	3 1	- 9	—	—	—	9.4
Lemberg	13.2	342	e 5 21?	28	(5 21)	-28	6.4	9.4
Monte Cassino	13.5	293	3 8	-12	—	—	—	8.3
Zagreb	13.7	313	i 3 12	-10	i 6 21	-20	—	8.4
Rocca di Papa	14.4	293	i 3 31	0	6 22?	- 4	e 8.2	10.7
Pola	14.5	306	—	—	—	—	—	11.2
Graz	14.7	316	3 25	-10	—	—	—	—
Vienna	14.9	321	e 3 21	-17	—	—	—	—
Milan	17.8	304	4 37	+22	10 31	?L	(10.5)	11.6
Moncalieri	18.7	301	4 31	- 6	8 0	+ 5	10.6	12.3
Zurich	18.9	309	e 4 10	-18	—	—	—	—
Algiers	21.8	277	4 59	- 4	8 59	- 2	12.7	15.3
Barcelona	22.2	289	e 4 58	- 9	9 2?	- 7	11.0	15.5
Uccle	22.9	314	e 5 3	-13	e 9 3	-20	e 12.3	—
De Bilt	23.0	318	—	—	9 13	-12	11.0	14.3
Tortosa	23.4	288	5 11	-10	9 5	-28	12.8	17.4
Shide	26.1	311	11 10	28	(i 11 10)	46	15.6	18.3
Bidston	28.1	316	8 45	?	14 39	?L	(14.6)	21.0
Eskdalemuir	28.9	319	—	—	10 39?	-36	15.8	17.4
Edinburgh	29.1	320	10 50	28	(10 50)	-29	—	—
San Fernando	29.2	279	—	—	—	—	16.7	18.8
Rio Tinto	29.2	282	11 45	28	(11 45)	+25	—	22.7
Coimbra	30.2	288	—	—	e 10 52	-42	18.1	—
Colombo	54.0	112	30 45	?L	—	—	(30.8)	36.8

Additional records: Athens MN = +4.8m. Pompeii M. = +12.0m.
Zagreb ePNE = +3m.6s., iNE = +5m.0s., i = +7m.4s., MNW = -9.3m.
Pola MN = +12.3m. Moncalieri MN = +11.9m. De Bilt MN
+13.0m. Epicentre 38° 3N. 30° 8E. San Fernando MN = +18.2m.
Coimbra LN = +17.1m.

1918. Jan. 16d. 13h. 27m. 25s. Epicentre 19° 0N. 80° 0W.

as on 1917 Feb. 20d. 19h.

A = +.164, B = -.931, C = +.326; D = -.985, E = -.174;
G = +.057, H = -.321, K = -.946.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	m.	s.	m. s.	s.	m. s.	s.	m.	m.
Vieques	13.8	91	—	—	(5 35)	-28	5.6	9.8
Toronto	24.6	1	—	—	—	—	19.1	28.4
La Paz	37.4	161	i 6 34	-59	i 11 30	-120	16.2	17.6
Andalgala	N. 48.5	164	—	—	15 41	-19	—	18.9
	E. 48.5	164	—	—	15 47	-13	—	19.1
Pilar	N. 53.0	163	17 29	28	(17 29)	+33	23.1	27.4
	E. 53.0	163	17 23	28	(17 23)	+27	23.2	27.4
Chacarita	57.4	159	18 53	28	(18 53)	+62	24.7	36.4
Rio Tinto	65.6	56	19 35	28	(19 35)	+ 3	—	40.6
Eskdalemuir	67.0	37	—	—	i 19 45	- 5	37.6	—
Edinburgh	67.0	36	34 5	?L	38 0	?	(34.1)	44.6
Bidston	67.1	39	53 47	?	—	—	—	37.0
Kew	68.9	41	—	—	—	—	—	41.6
De Bilt	72.2	40	—	—	e 28 53	?	e 36.6	37.3
Rocca di Papa	79.4	49	e 12 4	-11	—	—	—	12.9
Pola	79.4	46	(e 12 5)	-10	—	—	e 12.1	16.7
Vienna	80.0	42	e 12 16	- 3	—	—	—	—
Pompeii	81.0	50	12 16	- 9	—	—	—	—
Helwan	97.8	55	25 35	28	(25 35)	+ 1	—	—
Colombo	147.3	39	—	—	—	—	83.6	—

Additional records: Vieques gives MN = -7.9m. Toronto eL = +24.0.
May not be seismic. De Bilt eN = +29m.47s., MN = +37.4m.

Jan. 16d. 16h. 32m. 6s. Epicentre $38^{\circ}8'N$. $32^{\circ}9'E$.

A = +.654, B = +.423, C = +.627; D = +.543, E = -.840;
G = +.526, H = +.340, K = -.779.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Athens	7.2	266	e 1 49	0	3 16	+1	e 4.1	7.0
Lemberg	12.7	333	—	—	—	—	e 6.7	7.7
Pompeii	14.2	283	3 26	- 3	7 54	?L	(7.9)	12.2
Zagreb	11.3	304	e 3 34	+ 4	i 6 21	+6	—	8.4
Monte Cassino	14.7	286	3 54	+19	—	—	—	17.9
Moncalieri	19.6	296	e 4 49?	+13	—	—	11.3	16.2
De Bilt	23.3	314	—	—	e 9 33	. 2	e 12.9	15.5
Paris	23.9	305	e 11 54	?L	—	—	(15.9)	—
Edinburgh	29.3	318	13 54	?L	—	—	(13.9)	—

Additional records: Lemberg +7m.30s. Zagreb MNW = +9.4m. Moncalieri
MN = -14.9m. De Bilt MN = -13.3m. Rocca di Papa eP = 16h.30m.31s.,
eL = 16h.42m.18s., e = 16h.31m.18s., iL 16h.40m.56s., M = 16h.43m.48s.

Jan. 16d. Records also at 1h. (Manila), 3h. (Colombo and La Paz (2)), 6h. (Manila), 8h. (Paris), 10h. (Manila and La Paz), 12h. (Zagreb), 13h. (Harvard), 15h. (Manila), 17h. (Pompeii), 22h. (Helwan), 23h. (Taihoku).

Jan. 17d. Records at 0h. (San Fernando), 1h. (Melbourne), 2h. (Athens and Helwan), 3h. (Zagreb), 6h. (Helwan), 7h. (Manila), 9h. (Athens), 12h. (Athens (2) and Osaka), 17h. (Athens), 18h. (Osaka), 23h. (San Fernando).

Jan. 18d. 10h. 35m. 5s. Epicentre $12^{\circ}0'N$. $95^{\circ}0'E$. (as on 1917 Jan. 20d. 23h.48m.).

A = -.085, B = +.974, C = +.208; D = +.996, E = +.087;
G = -.018, H = +.207, K = -.978.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Colombo	15.8	252	13 25	?L	—	—	(13.4)	—
Manila	25.5	83	e 5 31	-12	—	—	7.8	—
Zi-ka-wei	31.0	18	e 6 42	+ 4	e 11 51	0	—	—
Kobe	42.8	51	e 7 6	-71	—	—	e 13.0	13.8
Perth	48.3	156	8 55	- 1	—	—	—	—
Mizusawa	48.9	48	12 55	?PR ₁	14 21	-104	—	—
Helwan	61.3	298	21 55	?SR ₁	—	—	—	—
Melbourne	68.3	139	(11 13)	+ 7	(14 13)	?SR ₁	14.2	14.8
Riverview	70.4	133	i 11 23	+ 4	(14 13)	?SR ₁	e 14.2	20.2
Edinburgh	84.6	326	—	—	—	—	—	37.9
La Paz	163.1	253	i 18 30	?L	—	—	—	—

Additional records: Bombay ($\Delta = 22^{\circ}4$ Az. = 291°) 10h.55m. to 10h.59m.
Kobe PSN = +6m.56s. Riverview i = +14m.39s., MN = +20.6m.
Edinburgh M = +76.9m.

Jan. 18d. Records also at 6h. (Perth), 11h. (Osaka and Batavia), 12h. (Mizusawa), 15h. (Manila), 17h. or 18h., and 19h. (La Paz), 20h. (Manila), 21h. (San Fernando).

Jan. 19d. Records at 1h. (Rocca di Papa (2) and Monte Cassino), 2h. (Tacubaya), 3h. (Manila), 7h. (Rio Tinto and Bombay), 8h. (La Paz), 12h. (Lick), 14h. (Rocca di Papa and La Paz).

Jan. 20d. 2h. 36m. 45s. Epicentre $39^{\circ}0'N$. $23^{\circ}0'E$. (as on 1917 Jan. 13d.).

A = -.715, B = -.304, C = -.629; D = +.391, E = -.920;
G = +.579, H = +.246, K = -.777.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Athens	1.2	147	i 0 19	+ 1	(0 32)	- 1	0.6	0.7
Pompeii	6.8	288	0 29	?L	3 15	+10	—	—
Monte Cassino	7.4	292	1 45	- 7	—	—	—	—
Rocca di Papa	8.3	293	2 3	- 3	—	—	—	2.6
Zagreb	8.6	326	e 2 21	+11	i 3 22	-31	—	5.1
Pola	9.0	313	e 4 3?	?S	(e 4 3?)	0	e 5.2	5.5
Graz	9.8	328	—	—	—	—	e 5.2	—
Vienna	10.4	335	—	—	—	—	e 6.2	—
Helwan	11.4	141	12 15	?L	—	—	—	—
Moncalieri	12.8	303	—	—	—	—	7.8	—
De Bilt	18.0	322	—	—	—	—	e 10.4	—
Edinburgh	24.2	323	—	—	—	—	—	18.2

Additional records: Athens records the same P L M for an earlier shock
T₁ = 2h.36m.9s., as well as for the above. Zagreb iNE = +4m.39s.,
iM = 7.5m.3s., MNW = +5.5m.

Jan. 20d. Records also at 6h. (San Fernando), 7h. (Athens), 19h. (Taihoku and Zi-ka-wei), 23h. (Mizusawa).

1918. Jan. 21d. 19h. 45m. 20s. Epicentre $2^{\circ}08'. 133^{\circ}0E$.

A = -682, B = -731, C = -635; D = -731, E = -682;
G = -924, H = -926, K = -999.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Manila	20.5	325	e 4 40	-7	8 17	-17	10.8	12.6
Batavia	26.4	260	e 5 57	-5	-	-	-	11.7
Adelaide	33.3	172	-	-	-	-	-	19.6
Perth	34.0	207	7 10	5	-	-	-	-
Riverview	36.1	154	17 21	-2	e 12 40	-31	e 18.3	22.4
Sydney	36.1	154	13 16	28	(13 16)	5	20.3	21.4
Kobe	36.7	3	-	-	-	-	-	19.0
Melbourne	37.4	165	13 40	28	(13 40)	19	(18.8)	21.6
Colombo	53.8	280	16 40	28	(16 40)	-26	-	57.8
Honolulu	71.2	67	-	-	-	-	e 35.4	11.2
Mauritius	75.3	250	22 1	28	(22 1)	35	-	38.0
Victoria	100.6	41	-	-	-	-	45.0	62.0
Helwan	101.2	300	22 40	?	-	-	-	-
Berkeley	102.8	52	-	-	-	-	e 50.2	-
De Bilt	113.9	328	-	-	e 35 40	28.3	e 59.7	68.0
Moncalieri	115.7	320	-	-	e 62 28	21	66.8	-
Edinburgh	115.8	334	35 40	28.3	-	-	-	73.7
Stonyhurst	116.7	332	36 40	28.3	1.58 40	21	(1.58.7)	78.7
Kew	117.1	329	-	-	-	-	-	73.7
Paris	117.1	326	-	-	-	-	e 63.7	-
San Fernando	129.1	317	24 40	?	67 55	21	83.2	89.4
Toronto	129.4	30	-	-	-	-	68.8	79.5
La Paz	152.1	132	i 20 17	(-18)	34 23	?	e 78.7	88.4

Additional records: Manila MN = +11.5m., T_0 = 19h.45m.30s. Riverview PS = +13m.21s., i = +20m.28s., MN = +21.4m., MZ = +24.4m., T_0 = 19h.45m.58s., Melbourne SR = +20m.34s., L = +21.3m. Colombo MR = +24.1m. Victoria L? = +53.9m. De Bilt MN = +74.3m. Toronto L = +72.8m.

Jan. 21d. Records also at 0h. (Helwan), 21h. (Melbourne).

Jan. 22d. 1h. 28m. 44s. and 33m. 58s. Epicentre roughly $15^{\circ}08'. 121^{\circ}0E$. A double shock recorded by Manila.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
I Batavia	16.5	301	e 4 16	-17	-	-	-	-
I Manila	29.6	0	e 6 22	-2	-	-	-	-
II	29.6	0	e 6 22	-2	-	-	-	-
II Melbourne	31.1	142	-	-	-	-	19.2	20.6
II Riverview	33.1	130	e 6 56	-1	e 12 32	-6	e 17.9	20.9
II Colombo	46.3	295	21 2	21	-	-	(21.0)	-
II Helwan	97.1	299	53 2	21	-	-	(53.0)	-

Jan. 22d. Records also at 7h. (Colombo), 12h. (Tortosa and Barcelona).

Jan. 23d. Records at 3h. (San Fernando), 12h. (La Paz), 14h. (Marseilles), 17h. (Helwan and Moncalieri), 18h. (Manila), 19h. (Moncalieri), 21h. (San Fernando), 22h. (La Paz).

Jan. 24d. 14h. 52m. 36s. Epicentre $18^{\circ}08'. 173^{\circ}0W$. (as on 1917 June 24d.).

A = -944, B = -116, C = -309; D = -122, E = +993;
G = +307, H = +938, K = -951.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Apia	4.3	17	1 24	+17	-	-	3.4	-
Riverview	35.7	236	e 7 0	-19	e 12 56	-10	17.0	21.2
Sydney	35.7	236	6 12	-67	-	-	17.0	20.0
Honolulu	42.0	21	-	-	15 51	79	-	20.4
Adelaide	46.0	239	20 48	21	-	-	(20.8)	29.0
Victoria	79.8	31	47 36?	21	-	-	(47.6)	51.0
La Paz	98.4	69	-	-	-	-	48.6	50.8
Toronto	104.8	48	-	-	-	-	50.2	56.6
Edinburgh	141.4	9	86 39	?	-	-	-	89.4
De Bilt	145.9	2	-	-	-	-	e 89.4	-
Zurich	150.6	357	-	-	-	-	58.2	-
Helwan	154.7	303	34 24	?	-	-	-	-
San Fernando	158.0	29	-	-	-	-	86.4	93.4

Additional records: Riverview MN = -20.6m., MZ = -21.4m., La Paz M = -55.8m., Toronto LE = +54.2m., eL = +57.6m., Zurich eE = +58.4m.

Jan. 24d. Records also at 1h. (Port au Prince), 3h. (Zi-ka-wei and Manila), 12h. (Zi-ka-wei, Osaka, Kobe, and Mizusawa), 23h. (Riverview and Rocca di Papa).

1918. Jan. 25d. 1h. 20m. 30s. Epicentre 12° 0N. 95° 5W.

A = -091, B = -074, C = +208; D = -995, E = +096;
G = -020, H = -207, K = -978.

		Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	E.	16.0	99	3 26	-26	—	7.2	3.5
	N.	16.0	99	3 30	-22	—	7.3	3.6
Tucson	N.	24.7	328	5 37	+2	—	—	18.5
	E.	24.7	328	5 8	-27	—	—	15.5
St. Louis		27.0	9	6 12	+14	(10 48)	+7	10.8
Vieques	N.	29.7	74	5 5	?	(11 50)	+21	11.8
	E.	29.7	74	4 50	?	(11 45)	+16	11.8
Cheltenham		31.5	29	11 40	?	(11 40)	-20	e 16.5
Georgetown	E.	31.5	28	e 6 8	-35	13 1	+61	20.5
	N.	31.5	28	e 6 8	-35	13 5	+65	20.5
Washington		31.5	28	e 6 10	-33	10 42?	-78	13.8
Ann Arbor		32.0	17	6 18	-29	12 54	+46	16.3
Toronto		34.5	21	5 6?	?	—	e 16.7	21.4
		34.5	21	9 18	?PR ₁	e 13 30	+42	i 20.4
Lick		34.5	322	—	—	13 40	+52	—
Ithaca		34.6	25	e 11 54	?	(e 11 54)	-55	16.1
Fordham		34.6	30	—	—	—	—	e 9.5
Berkeley		35.3	322	11 27	?	(e 11 27)	-93	—
Harvard		37.1	30	—	—	e 9 9	?PR ₁	e 15.0
Ottawa		37.4	23	e 7 50	+17	e 15 18	+108	e 16.9
Northfield		37.7	27	e 8 30	?PR ₁	—	—	—
La Paz		39.3	136	i 7 50	+1	12 37	-79	17.7
Victoria		43.2	333	—	—	15 5?	+14	25.0
Honolulu		60.3	288	—	—	e 19 24	+57	e 30.0
Coimbra		80.1	51	—	—	—	—	39.9
Edinburgh		81.4	34	44 30	?L	—	—	(44.5)
Bidston		81.8	37	35 54	?L	—	—	(35.9)
Rio Tinto		81.8	53	33 30	?L	—	—	(33.5)
Stonyhurst		82.1	36	e 24 30	?	(e 24 30)	+103	i 41.0
San Fernando		82.4	51	22 30	?	(22 30)	-20	40.5
Kew		83.9	39	39 30	?L	—	—	(39.5)
Paris		86.2	41	—	—	—	—	e 44.5
Uccle		86.8	39	e 12 32	-26	—	—	e 41.5
De Bilt		87.0	37	—	—	e 23 37	-4	e 35.5
Moncalieri		90.7	44	—	—	—	—	42.8
Graz		95.0	40	e 13 30	-13	—	—	—
Rocca di Papa		95.2	45	13 22	-22	—	—	—
Zagreb	N.W.	95.8	41	e 13 27	-21	i 24 24	-50	47.5
	N.E.	95.8	41	i 13 32	-16	i 24 24	-50	—
Helwan		113.9	49	29 30	?	(29 30)	+89	—
Riverview		116.0	238	—	—	—	—	e 66.0
Melbourne		120.6	233	—	—	—	—	62.1

Additional records: Cheltenham PN = +11m.19s., MN = +18.7m. George-town eL = +16.7m. St. Louis S = +9m.54s., L = +15.1m. Harvard eSRN = +12m.45s., eLN = +14.9m., MN = +21.1m. Ann Arbor LN = +16.5m., MN = +19.5m., P = +6m.12s., S = +12m.48s., L = +16.3m., M = +21.4m. Toronto iL = +17.3m. Ottawa L = +20.5m., T₀ = 1h.21m.32s. La Paz PR = +9m.17s. Victoria L? = +19.6m. Eskdalemuir from 1h.50m. to 2h.30m. San Fernando MN = +47.5m. Paris eLN = +38.5m. De Bilt MN = +35.9m. Vienna T₀ = 1h.20m.22s. Tacubaya T₀ = 1h.21m.0s.

Jan. 25d. Records also at 1h. (Mizusawa and Vieques), 3h. (Zagreb, Mauritius, Colombo, Athens, and Rocca di Papa), 15h. (Riverview), 20h. (Manila, San Fernando, and La Paz), 22h. (Melbourne, La Paz, and Riverview), 23h. (Helwan).

Jan. 26d. Records at 0h. (Taihoku (2), Zikawei, and Lick), 1h. (Tacubaya), 3h. (Melbourne and Riverview), 5h. (Helwan), 8h. (Lemberg), 13h. and 15h. (Monte Cassino), 18h. (La Paz and Balboa Heights), 20h. (San Fernando).

Jan. 27d. 2h. 51m. 2s. Epicentre $64^{\circ}8'N$, $35^{\circ}3'E$.

A = +.348, B = +.246, C = +.905; D = -.578, E = -.816;

G = +.738, H = +.523, K = -.426.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Vienna	19.4	221	7 16	?s	(7 16)	-.54	—	—
De Bilt	19.9	245	4 41	- 1	e 8 23	-. 2	19.0	12.4
Edinburgh	20.6	263	6 58	?	—	—	—	9.2
Graz	20.7	221	e 5 40	?PR ₁	e 10 40	?L (e 10.7)	—	—
Eskdalemuir	21.0	261	—	—	(7 58)	-.46	—	—
Hohenheim	21.2	233	e 5 13	+18	—	—	—	—
Uccle	21.2	244	e 4 46	- 9	—	—	e 12.0	—
Zagreb	21.7	219	e 5 49	+48	—	—	15.0	18.0
Stonyhurst	21.7	258	—	—	—	—	—	7.2
Moncalieri	24.9	231	e 6 58?	?PR ₁	9 58?	- 3	13.5	—
Rocca di Papa	26.4	220	e 5 58	+ 6	—	—	e 19.1	21.1

Additional records: Hamburg ($\Delta = 16^{\circ}9'$), Epicentre $73^{\circ}2'N$, $12^{\circ}2'E$, $T_0 = 2h.51m.0s$. De Bilt MN = +10.5m. Rocca di Papa M = +6.6m.

Jan. 27d. 12h. 56m. 35s. Epicentre $36^{\circ}2'N$, $21^{\circ}4'E$.

A = +.751, B = +.294, C = +.591; D = +.365, E = -.931;

G = +.550, H = +.216, K = -.807.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Athens	2.5	47	0 39	0	—	—	1.0	1.2
Pompeii	7.0	312	1 37	- 9	—	—	—	—
Monte Cassino	7.8	314	2 10	+12	—	—	—	6.2
Rocca di Papa	8.7	311	2 11	- 1	—	- 2	—	5.4
Pola	10.3	328	e 2 14	-20	e 3 59	-39	e 5.3	5.9
Zagreb	10.4	339	e 2 29	- 7	i 4 23	-17	i 5.0	6.2
Milan	13.0	319	4 45	?	—	—	—	9.1
Moncalieri	13.5	315	4 6?	-.46	6 22	-26	7.5	—
Zurich	14.6	324	e 3 35	+ 1	—	—	—	—
Uccle	19.0	325	e 7 25	?S	(e 7 25)	-37	10.5	—

Additional records: Zagreb i = +3m.57s., MNW = +6.0m.

Jan. 27d. Records also at 0h. (Manila, Andalgala, Pilar, La Paz, Cipolletti, and Chacarita), 1h. (Helwan), 2h. (Capetown), 3h. (Rocca di Papa (2), and Zagreb), 4h., 5h., and 8h. (Athens), 11h. (Rocca di Papa), 13h. (Helwan), 17h. (Athens), 20h. (Lick), 21h. (Stonyhurst, San Fernando, and Pa Paz).

Jan. 28d. Records at 3h. (Helwan and Port-au-Prince), 8h. (Helwan), 14h. (Batavia), 22h. (Batavia and San Fernando).

Jan. 29d. 11h. 16m. 20s. Repetition from $45^{\circ}6'N$, $16^{\circ}4'E$ as 1917 Jan. 29d. 8h.

	Δ	P.	O-C.	S.	O-C.	L.	M.
		m. s.	s.	m. s.	s.	m.	m.
Zagreb	0.3	i 0 5	0	i 0 9	- 1	—	0.2
Pola	2.0	e 0 28	-3	—	—	e 0.8	0.9

Pola gives MN = +0.8.

Jan. 29d. Records also at 0h. (Balboa Heights), 3h. (Manila), 12h. (La Paz), 13h. (Manila), 15h. (Barcelona).

1918. Jan. 30d. 21h. 18m. 27s. Epicentre 47°5N. 129°0E.

A = -425, B = +525, C = +737; D = +777, E = +629;

G = -464, H = +573, K = -676.

		Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Mizusawa		12.1	129	1 49	—	—	—	—
Kobe		13.6	158	i 2 35	-46	—	4.5	7.5
Osaka		13.7	157	2 38	-44	—	4.7	—
Nagasaki		14.8	177	1 46	?	—	—	—
Zi-ka-wei		17.3	202	i 4 1	-8	e 6 33	-52	7.2
Taihoku		23.5	197	4 56	-27	5 58	-217	8.8
Manila		33.6	194	i 6 17	-44	11 17	-77	14.0
Calcutta	N.	40.9	247	8 3	+ 1	14 15	-5	19.3
	E.	40.9	247	7 51	-11	13 57	-23	19.1
Dehra Dun		42.3	265	9 33	?PR ₁	—	—	—
Sinla		42.4	266	8 15	+ 1	14 39	- 1	20.9
Bombay		53.5	258	9 22	- 8	17 10	+ 7	19.6
		53.5	258	9 34	- 4	17 9	- 6	24.6
Kodaikanal		57.0	247	—	—	—	17.5	19.0
Batavia		57.1	210	i 9 29	-24	—	—	16.5
Colombo		58.2	242	(11 9)	+69	(18 15)	+14	18.2
Lemberg		63.0	316	i 10 43	+11	(i 19 18)	+17	i 19.3
Honolulu		63.1	86	e 9 45	-48	17 33	-89	e 24.3
Victoria		65.5	44	(10 5?)	-43	(15 32?)	-239	i 18.8
Dyce		67.7	334	i 11 9	+ 7	20 3	+ 5	30.2?
De Bilt		69.5	327	i 11 14	0	i 20 17	- 3	—
Eskdalemuir		69.6	333	11 10	- 5	20 17	- 4	34.5?
Zagreb	N.E.	69.8	317	11 15	- 1	e 20 19	- 5	—
	N.W.	69.8	317	i 11 20	+ 4	i 20 24	0	i 31.2
Uccle		70.8	327	i 11 17	- 5	i 20 27	- 9	30.6
Pola		71.5	317	i 11 25	- 2	i 20 43	- 1	e 31.1
Athens		71.8	307	i 11 28	0	i 20 48	0	32.3
Zurich		71.9	322	i 11 27	- 2	i 20 46	- 3	—
Kew		71.9	329	20 33	?S	(20 33)	-16	—
Bidston		72.4	332	11 39	- 7	20 33	-22	—
Besancon		73.1	323	11 34	- 3	18 57	-126	—
Paris		73.1	326	i 11 33	- 4	i 20 54	- 9	29.6
Milan		73.3	320	11 26	-12	20 54	-12	—
Berkeley		73.6	51	i 10 51	-49	i 19 38	-91	—
Helwan		73.3	296	58 23	?L	—	—	(58.4)
Monte Cassino		74.2	315	11 42	- 1	—	—	—
Moncalieri		74.2	321	i 11 35	- 8	i 21 0	-16	30.9
Pompeii		74.3	314	i 11 37	- 7	i 21 16	- 2	32.5
Lick		74.4	51	e 10 56	-49	e 19 50	-89	—
Rocca di Papa		74.5	316	i 11 41	- 5	i 21 12	- 8	e 32.1
Marseilles		76.5	321	i 11 54	- 4	i 21 40	- 3	—
Barcelona		79.3	322	i 12 5	-10	i 21 55	-20	33.9
Perth		80.3	191	12 2	-19	—	—	—
Tortosa		80.6	323	12 1	-22	22 1	-29	35.6
Algiers		82.9	319	i 12 22	-13	22 21	-35	38.6
Adelaide		82.9	172	21 21	?S	(21 21)	-95	—
Riverview		83.7	162	i 11 43	-57	i 23 35	+29	e 33.3
Sydney		83.7	162	21 15	?S	(21 15)	-111	34.3
Coimbra		84.5	329	12 27	-18	i 22 46	-28	36.6
		84.5	329	—	—	i 23 23	+ 9	37.0
Ottawa		84.6	17	i 12 9	-37	i 21 57	-78	e 38.1
Toronto		85.5	20	—	—	i 23 9	-16	40.8
Ann Arbor		85.6	24	12 33	-18	22 3	-83	39.2
Rio Tinto		86.0	326	19 33	?	—	—	—
Northfield		86.4	15	12 25	-30	22 10	-84	—
St. Louis		87.0	30	22 3	?S	(22 3)	-98	25.6
San Fernando		87.0	325	12 45	-14	(22 33)	-68	22.6
Ithaca		87.3	18	e 16 33	?PR ₁	i 22 27	-77	—
Harvard		88.4	15	(15 6)	+119	(i 23 52)	- 4	39.2
Fordham		89.3	17	e 17 57	?PR ₁	(31 33)	?SR ₁	31.6
Georgetown	E.	90.5	20	e 12 36	-43	i 22 33	-106	42.8
	N.	90.5	20	i 12 34	-45	i 22 33	-106	19.9
Washington		90.5	20	12 35	-44	22 33	-106	42.6
Cheltenham		90.7	20	e 12 39	-41	—	—	—
Mauritius		92.7	213	15 57	-116	(22 33)	-129	—
Capetown		127.4	258	23 3	?	—	—	—
La Paz		115.9	30	i 18 6	31	32 14	- 37	69.5
Andagala		156.8	36	48 33	?SR ₁	—	—	—
Pilar	E.	161.4	36	54 39	?	—	—	—
	N.	161.4	36	54 33	?	—	—	—
Cipolletti		164.9	62	30 9	?	—	—	—

For Notes see next page.

NOTES TO JAN. 30d. 21h. 18m. 27s.

Additional records: Zi-ka-wei gives MN = +7.5m. Kobe MN = +5.2m.
 Manila T_0 = 21h.18m.25s. Kodaikanal P = 21h.0m.18s. Colombo
 M = +32.2m. Lemberg eS = +15m.3s. Honolulu T_0 = 21h.18m.28s.
 Victoria P? = +5m.3s. De Bilt ePR₁ = +17m.2s., i_2 = +21m.50s., eE =
 +30m.22s., eN = +30m.30s., m = +30m.58s., eE = +33m.3s., MN = +41.6m.,
 T_0 = 21h.18m.38s. Shide quake recorded but time shutter not working.
 Eskdalemuir PR₁ = +14m.17s., PR₂ = +15m.51s., T_0 = 21h.18m.30s., and
 two i's. Zagreb T_0 = 21h.18m.43s. Uccle i = +22.0m., T_0 =
 21h.18m.34s. Pola MN = +32.0m., T_0 = 21h.18m.33s. Athens T_0 =
 21h.18m.34s. Zurich T_0 = 21h.18m.34s. Paris PR₁ = +17m.32s.,
 SR₁ = +22m.29s., T_0 = 21h.18m.38s. Moncalieri MN = +33.8m., T_0 =
 21h.18m.36s. Marseilles T_0 = 21h.18m.36s. Riverview iS = +11m.15s.,
 MN = +36.9m. Algiers T_0 = 21h.18m.48s. Coimbra SE? = +21m.46s.,
 iSN = +22m.24s., L = +46.6m. Ottawa T_0 = 21h.18m.46s. Toronto
 L = +48.6m. Ann Arbor PN = +12m.9s., LN = +38.6m., MN = +39.6m.
 Harvard T_0 = 21h.18m.9s. Fordham LN = +36.6m. Georgetown
 iPZ = +12m.38s., iSZ = +22m.33s., LZ = +49.1m., T_0 = 21h.19m.0s.
 Cheltenham MN = +22.7m. Mauritius MN = +39.4m. Melbourne
 records "A considerable shock about 21h.40m." Vienna T_0 = 21h.18m.33s.
 Graz T_0 = 21h.18m.26s.

Jan. 30d. Records also at 2h. (Helwan), 3h. (Mizusawa), 16h. (Perth), 17h.
 (Perth and Rocca di Papa), 20h. (Colombo and Batavia), 21h. (Perth).

Jan. 31d. Records at 1h. (Perth), 4h. (Batavia), 11h. (Pompeii and Rocca di
 Papa), 13h. (La Paz), 18h. (Mauritius), 22h. (Melbourne), 23h. (Helwan).

Feb. 1d. 12h. 31m. 14s. Epicentre 39° 3'N. 21° 0'E. (as on 1917 May 23d. 5h.).

A = +.722, B = +.277, C = +.633; D = +.358, E = -.934;
 G = +.591, H = +.227, K = -.774.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	2.6	120	i 0 27	-14	—	—	0.8	1.1
Monte Cassino	5.9	294	e 2 25	?S	(2 25)	-16	—	—
Rocca di Papa	6.8	294	e 1 59	+16	—	—	—	5.3
Zagreb	7.5	332	e 2 27	+33	e 2 58	-26	i 4.2	5.5
Pola	7.6	319	e 3 46	?S	(e 3 46)	+20	e 4.9	6.6

Additional records: Zagreb i = +4.8m. Pola MN = +5.7.

Feb. 1d. Records also at 2h. (La Paz, Colombo, and San Fernando), 8h. (La Paz
 and Harvard), 10h. (Helwan), 22h. (Helwan and Lick), 23h. (Lick).

Feb. 2d. Records at 0h. (San Fernando), 5h. (Manila), 7h. (Stonyhurst), 8h.
 (Helwan), 9h. (Riverview), 11h. (Algiers), 20h. (Batavia and San Fer-
 nando), 23h. (Zurich).

1918. Feb. 3d. 14h. 2m. 30s. Epicentre 18° 0'S. 173° 0'W.

(as on 1917 June 24d.).

A = -.944, B = -.116, C = -.309; D = -.122, E = +.993;
 G = +.307, H = +.038, K = -.951.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia	4.3	17	e 1 12	+ 5	—	—	2.7	3.7
Sydney	35.7	236	6 0	-79	—	—	15.0	18.1
Riverview	35.7	236	e 7 6	-13	e 11 12?	-114	14.5	18.0
Melbourne	41.6	233	e 8 30	+22	e 15 48	+79	—	23.9
Honolulu	42.0	21	e 14 24	?S	(e 14 24)	-11	e 17.3	19.0
Adelaide	46.0	239	18 42	?L	—	—	(18.7)	28.1
Perth	64.9	242	—	—	17 48	-96	—	—
Berkeley	73.4	40	—	—	e 22 30	+83	—	—
La Paz	98.4	69	17 4	?PR ₁	—	—	47.0	51.4
Ann Arbor	101.5	47	—	—	—	—	53.5	65.5
Washington	105.7	54	—	—	—	—	e 56.0	—
Ottawa	107.7	47	—	—	—	—	e 59.5	—
Harvard	110.6	51	—	—	—	—	e 58.9	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Eskdalemuir	141.8	9	—	—	—	—	75.5	—
Stonyhurst	143.5	9	i 41 36	?SR ₁	—	—	—	87.5
De Bilt	E. 145.9	2	—	—	e 42 6	?SR ₁	e 86.5	88.3
	N. 145.9	2	e 21 6	[+76]	—	—	e 87.5	94.0
Kew	146.0	8	—	—	—	—	—	92.5
Uccle	147.1	4	e 19 6	[-45]	—	—	—	92.5
Graz	150.1	348	—	—	—	—	e 78.5	—
Zagreb	151.2	347	e 19 8	[-49]	—	—	e 88.5	95.5
Moncalieri	153.1	359	—	—	—	—	e 82.9	—
Rocca di Papa	155.7	350	e 20 0?	[-3]	—	—	94.6	45.2
Rio Tinto	156.9	28	34 30	?S	(34 30)	—	—	—
San Fernando	N. 158.0	29	35 30	—	(35 30)	—	84.0	94.5
	E. 158.0	29	—	—	—	—	85.5	94.5

Additional records : Melbourne SR₁ = +19m.6s., L = +22.8m. Ann Arbor
 LN = +57.1m. Washington gives long waves from 14h.48m. to 15h.14m.
 Harvard L = +71.0m. Stonyhurst gives M = 14h.1m.30s., possibly 1h.
 wrong. Moncalieri L = +92.5m.

Feb. 3d. 14h. 41m. 50s. Epicentre 3°0S. 88°0W.

A = +.035, B = -.998, C = -.052; D = -.999, E = -.035;
 G = -.002, H = +.052, K = -.999.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Andalgala	E. 32.2	142	—	—	8 58	?	—	21.6
Pilar	N. 36.6	144	7 22	- 5	—	—	—	29.0
	E. 36.6	144	7 28	+ 1	13 22	+ 4	—	30.7
Chacarita	41.9	142	9 58	?PR ₁	—	—	—	—
Toronto	47.3	8	(e 19 4)	?SR ₁	—	—	17.0?	23.8
Victoria	59.9	334	(9 40)	-31	—	—	—	13.6
Bidston	89.3	36	30 34	?SR ₁	40 58	?L	(41.0)	48.9
Paris	92.6	41	—	—	—	—	e 48.2	52.2
Rocca di Papa	99.9	48	—	—	—	—	55.2	—

Additional records : Victoria P? = +3m.36s. Rocca di Papa, additional
 Ls at +58.1m., +86.9m., and +88.3m. The Victoria record is obviously
 out of place, and would be as well omitted from the table.

Feb. 3d. Records also at 3h. (Melbourne and La Paz), 9h. (La Paz), 11h. (Batavia)
 13h. (Edinburgh and Helwan), 14h. (Colombo), 23h. (San Fernando).

Feb. 4d. 0h. Epicentre apparently close to Zagreb, which gives a record at
 3m.24s. Taking Zagreb as epicentre and T₀ = 0h.3m.24s., we have,
 taking the mean of eN and eE for De Bilt :—

	Δ	P.	O-C.	L.
		m. s.	s.	m.
Moncalieri	5.9	e 1 29?	- 2	4.5
De Bilt	9.5	—	—	4.8

1918. Feb. 4d. 17h. 54m. 49s. Epicentre 29°6N. 87°8E.

A = +.033, B = -.869, C = -.494; D = -.999, E = -.038;
 G = +.019, H = -.494, K = -.870.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Calcutta	7.1	176	3 23	?S	8 59	?	—	—
Simla	9.3	282	—	—	—	—	e 6.7	10.7
Kodaikanal	21.7	209	16 41	?	—	—	—	19.3
Colombo	23.9	200	—	—	—	—	—	21.6
Manila	31.0	109	—	—	e 12 33	- 7	—	—
Batavia	40.2	150	—	—	—	—	e 23.2	—
Osaka	40.3	70	e 8 1	+ 4	14 0	-11	18.4	20.7
Helwan	48.5	285	9 11	+ 11	—	—	—	—
Budapest	54.8	310	—	—	—	—	e 23.6	—
Zagreb	N.E. 57.1	308	e 9 53	0	17 50	+ 3	31.2	33.7
Graz	57.2	310	e 9 46	- 7	—	—	—	—
Potsdam	58.0	316	—	—	—	—	e 28.7	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Pola	58.7	307	e 9 59	- 4	e 18 11	+ 4	e 33.4	33.6
Monte Cassino	59.6	303	10 11	- 2	—	—	—	—
Rocca di Papa	60.5	304	10 11	- 5	e 18 37	- 7	e 34.5?	39.9
De Bilt	62.8	317	10 30	- 1	18 44	-14	e 29.2	33.9
Moncalieri	63.0	309	10 26?	- 6	18 58	- 3	33.4	35.4
Uccle	63.5	316	e 10 23	-12	—	—	32.3	—
Paris	65.3	314	e 19 15	?S	(19 15)	-14	e 33.2	40.2
Kew	66.1	318	—	—	—	—	—	41.2
Edinburgh	66.4	322	19 11	?S	(19 11)	-31	—	41.7
Eskdalemuir	66.6	322	19 23	?S	26 48	?SR ₁	31.9	37.2
Stonyhurst	66.6	320	e 18 41	?S	(e 18 41)	-64	i 26.3	36.2
Bidston	67.1	320	20 17	?S	(20 17)	+26	—	38.2
Barcelona	67.9	306	—	—	—	—	e 36.6	43.6
Tortosa	69.3	306	11 13	0	—	—	36.4	38.9
San Fernando	75.8	304	27 11	?SR ₁	—	—	42.7	44.2
Coimbra	75.8	309	—	—	e 20 11	-84	41.8	—
Melbourne	86.0	138	—	—	—	—	58.2	60.4
La Paz	154.4	296	19 58	- 3	—	—	—	86.5

Simla gives MN = +9.4m. Zagreb gives records in N.W. Azimuth iP = +9m.59s., S = -17m.56s., MN = -32.6m., also i = -12m.2s. and T₀ = 17h.54m.49s. Rocca di Papa gives M = +10.4m. De Bilt iPN = -10m.31s., S = +18m.44s., ME = -39.0m. Moncalieri MN = -37.0m. San Fernando gives for the E.W. component L = 43.2m., M = -44.2m. Bidston S = +26m.29s. (?SR₁). Paris ePN = +19m.26s. De Bilt also gives an epicentre at 34° 0'N. 88° 0'E. (Tibet). Stonyhurst record is given three hours wrong.

Feb. 4d. 20h. 38m. 40s. Epicentre near Revelstoke, B.C. 51° 0'N. 118° 0'W.

A = -295, B = -556, C = -777.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Victoria	4.3	1 6	- 1	—	—	2.1	2.2
Ann Arbor	24.8	—	—	12 20	2L	15.3	—
Ottawa	28.3	—	—	e 11 26?	-22	e 14.8	—
Washington	30.9	—	—	—	—	e 15.3?	—
Georgetown	30.9	—	—	—	—	e 15.3	—

Victoria M = +1.6m. Ottawa gives also i = +13m.27s. and L = +16.3m.

Feb. 4d. Records also at 4h. (Athens), 5h. (Victoria), 8h. (Helwan), 10h. (Athens), 11h. (Zagreb and Rocca di Papa), 17h. (Zi-ka-wei and Rio Tinto), 19h. (Pola, Zagreb, and Bombay), 23h. (Graz).

Feb. 5d. 9h. 10m.56s. Epicentre 44° 0'N. 2° 5'E.

A = +.719, B = +.031, C = +.695 ; D = +.044, E = -.999 ;
G = -.694, H = -.030, K = -.719.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Marseilles	2.2	113	i 0 54	?S	(i 0 54)	- 7	—	—
Barcelona	2.6	186	0 31	- 7	1 12	0	1.4	2.6
Tortosa	3.5	193	0 52	- 3	1 33	- 4	2.0	3.2
Moncalieri	3.9	75	e 1 17?	+16	2 51?	?L	(2.9)	—
Algiers	7.2	176	0 54	?	2 4	?	6.6	—
Rocca di Papa	7.8	103	1 22	?	—	—	—	4.2

Marseilles gives e(S) = +3m.4s., eL = +7.1m. Moncalieri L = +3.8m.
Algiers P = +1m.15s.

Feb. 5d. Records also at 0h. (San Fernando), 3h. (Batavia), 5h. (San Fernando, Colombo, and Edinburgh), 10h. (La Paz (2), Chacarita, Andalgalá, and Cipolletti), 11h. (Pilar and Helwan), 21h. (Calcutta).

Feb. 6d. 3h. 10m. 30s. Epicentre $11^{\circ}0S$. $176^{\circ}0W$.

$A = -.979$, $B = -.068$, $C = -.191$; $D = -.070$, $E = +.997$;

$G = -.190$, $H = -.013$, $K = -.982$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Apia	5.0	125	e 1 18	- 1	—	—	2.6	4.1
Honolulu	36.9	28	e 13 30	?S	(e 13 30)	- 8	17.2	24.6
Riverview	37.7	228	—	—	13 36	+ 2	15.9	20.3
Melbourne	41.0	226	e 8 30	- 4	—	—	20.8	22.6
Victoria	75.4	33	—	—	—	—	53.9	—
Andalgalá	102.0	122	41 48	?L	—	—	(41.8)	56.0
Toronto	102.4	47	—	—	—	—	48.8	61.5
Pilar	102.4	126	50 12	?L	—	—	(50.2)	68.9
La Paz	103.6	110	17 23	?	—	—	49.6	56.3
Stonyhurst	136.8	5	54 30	?L	—	—	(54.5)	79.5
De Bilt	138.9	359	—	—	—	e	86.5	—
Helwan	148.3	311	38 30	?	—	—	—	—
Rocca di Papa ?	148.3	348	19 40	[-13]	—	—	—	20.2

Additional records: Riverview $MN = +17.8m$. Toronto $L = +50.0m$.
 $eL = +59.0m$. Stonyhurst $M = +85.5m$. The record for Rocca di Papa
 is almost certainly that of a local shock, since M closely follows P; but it has
 been included in the table as possibly a case where one shock may have
 started another.

Feb. 6d. 14h. 43m. 42s. Epicentre $11^{\circ}0S$. $176^{\circ}0W$., as at 3h.

	Δ	Az.	P.	O-C.	L.	M.
			m. s.	s.	m.	m.
Honolulu	36.9	28	—	—	e 15.3	20.2
Riverview	37.7	228	e 7 36?	0	e 17.9?	19.0
Melbourne	41.0	226	—	—	23.5	25.3
De Bilt	138.9	359	—	—	e 72.3	—
Kew	139.4	4	—	—	—	77.3
Helwan	148.3	311	45 18	?SR ₁	—	—

Riverview gives $MN = +21.8m$. Eskdalemuir ($\Delta = 135.4$) records 15h.55m.
 to 16h.5m. Apia records $P = 14h.41m.16s.$, $M = 14h.41m.41s.$, which is
 probably a close and local shock. If not, the above solution is sensibly in
 error.

Feb. 6d. Records also at 0h. (Denver), 4h. (San Fernando and De Bilt), 9h.
 (Mizusawa), 15h. (De Bilt), 17h. (Manila), 21h. (Monte Cassino), 22h.
 (San Fernando).

1918. Feb. 7d. 5h. 20m. 15s. Epicentre 6°5N. 127°0E.
 $\Lambda = -598, B = +793, C = +113; D = +799, E = +602;$
 $G = -068, H = +090, K = -994.$

A focal depth ± 0.25 is assumed, in spite of the positive residuals to [P] for Pilar and La Paz, as it is not possible to make a satisfactory solution without some such assumption.

Station and Component.	Corr. for Focus	Δ	Az.	P.		O. C.		S.		O. C.		L.		M.	
				N.	S.	S.		M.	S.	S.		M.		M.	
Manila	-0.3	10.0	325	i 2	29	+ 3						i 4.2		5.1	
Taihoku	-1.0	19.3	345	4	39	+18						8.0		8.6	
Batavia	-1.2	23.8	238	i 5	13	1		8	33	-44				9.6	
Zi-ka-wei	1.4	25.3	349	5	26	- 1		e 9	42	0				11.8	
Kobe	-1.7	29.2	14	6	15	+12		(10	46)	- 4		10.3		13.2	
Osaka	-1.7	29.2	14	6	12	+ 9		(10	50)	0		10.8		13.0	
Mizusawa	E. -2.0	35.0	19	6	53	- 3		12	16	- 8					
	N. -2.0	35.0	19	6	49	- 7		12	12	-12					
Perth	-2.1	39.9	195	(7	37)	+ 1		13	28	- 7		22.6		-	
Calcutta	E. -2.1	40.6	297	7	33	- 9		13	27	-18		17.6		-	
	N. -2.1	40.6	297	7	33	- 9		13	33	12		19.4		-	
Adelaide	-2.2	42.9	166	8	15	14		14	27	+10				25.8	
Riverview	-2.4	46.4	152	i 8	24	- 5		i 15	2	0		e 25.0		30.1	
Sydney	-2.4	46.4	152	8	21	- 5		15	21	+19		25.0		30.4	
Colombo	-2.4	46.8	273	(8	39)	-10		8	39	? P		15.6		20.7	
Melbourne	-2.5	47.3	161	(10	45)	? PR ₁		15	9	- 3		18.8		19.8	
Kodaiikanai	-2.6	49.1	278	11	51	? PR ₁						28.0		34.4	
Simla	-2.7	52.6	305	8	57	9		16	21	+ 3				27.4	
Bombay	-2.7	54.1	289	9	20	+ 4								27.5	
Mauritius	N. -3.2	72.9	247	20	33	? S		(20	33)	11		-		31.2	
	E. -3.2	72.9	247	11	9	- 6		(20	51)	+29		20.8		36.2	
Honolulu	-3.2	73.6	70	11	15	+ 4		20	45	+14		e 34.0		44.8	
Helwan	-3.5	91.7	300	12	45	- 21								61.2	
Lemberg	-3.5	93.2	321	i 13	27	+13		i 17	16	? PR ₁		-		24.7	
Budapest	-3.6	97.1	320	i 13	29	- 6		17	21	? PR ₁		-		-	
Victoria	-3.6	97.9	39	15	7	?		(23	58)	-61		24.0		27.6	
Potsdam	-3.6	99.0	326	e 12	45	-60								-	
Graz	-3.6	99.5	320	e 12	43	-65		e 26	57 ?	+102				-	
Zagreb	-3.6	99.6	319	i 13	45	- 4		i 24	13	-63		52.8		61.8	
Pola	-3.6	101.3	318	e 17	38	? PR ₁		e 24	22	-71		e 37.4		63.4	
Berkeley	-3.6	101.9	49					23	45	?				-	
Pompeii	-3.6	102.4	314	e 13	55	- 9		e 24	24	-80		e 49.3		59.8	
Monte Cassino	-3.7	102.6	315	14	4	- 1								-	
Hohenheim	-3.7	102.7	323					25	35	-11				-	
Rocca di Papa	-3.7	103.3	316	i 13	59	-10		i 24	28	-84		e 55.6		63.6	
De Bilt	-3.7	103.5	328	(18	19)	? PR ₁		i 24	34	-80		49.8		51.6	
Jyce	-3.7	104.2	334											55.2	
Uccle	-3.7	104.5	327	e 14	3	-11						e 42.8		-	
Moncalieri	-3.7	105.3	320	e 14	27	+ 9		19	2 ?	? PR ₁				-	
Eskdalemuir	-3.7	105.8	333	18	17	? PR ₁		24	44	-92		31.0		-	
Stonyhurst	-3.7	106.3	322	e 16	3	+100		i 25	27	-53		55.4 ?		68.2	
Paris	-3.7	106.4	326	e 18	41	? PR ₁		i 24	46	-97		52.8		53.8	
Kew	-3.7	106.6	329	18	45	? PR ₁								62.8	
Bidston	-3.7	106.9	332	17	3	?		25	15	-71				43.5	
Barcelona	-3.8	110.5	319	e 21	34	? PR ₁		28	41 ?	+103				-	
Tortosa	-3.8	111.9	319	19	20	? PR ₁		28	57	?				60.2	
Algiers	-3.8	112.1	314	e 19	15	? PR ₁		28	56	?		48.8		63.8	
Coimbra	-	117.9	323	20	2	? PR ₁		i 29	26	+53		61.8		66.4	
Rio Tinto	-	118.1	320	16	45	+71								27.8	
San Fernando	-	118.7	318	19	15	? PR ₁		29	15	+35		63.2		88.2	
Toronto	-	124.4	23	22	15	? PR ₁		(e 38	33)	? SR ₁		e 38.6		80.0	
Pilar	-	152.9	159	20	15	(-15)		43	45	-				45.6	
La Paz	-	162.1	125	i 20	9	0		32	43	-		65.0		70.4	

For Notes see next page.

NOTES TO FEB. 7d. 5h. 20m. 15s.

Additional records: Manila MN = +4.9. Zi-ka-wei gives SRN₁ = +10m.26s., SRE = +10m.30s., SRN₂ = +11m.3s. Kobe MN = +15.1m. Osaka MN = -15.1m. Perth record for PR₁ has been taken as P. Adelaide record for PR₁ has been taken as S. Riverview i = +9m.1s., PS = +15m.47s., cSR₁? = +18m.9s., i = +18m.16s., epicentre 19° 0'N. 121° 0' E. (approx.). Sydney SR = +19m.21s. Melbourne S = +10m.45s. (probably PR₁) and SR₁ = +15m.9s. (probably S), SR₂ = +15m.57s. Honolulu M = +22.0m. Lemberg i = +23m.52s. (?S). Zagreb ePN = +13m.42s. Pola MN = +60.0m. Uccle PR₁ = +18m.21s. De Bilt PR₁N = +18m.20s., e = +27m.36s., M = +55.1m. Coimbra MN = +64.1m. San Fernando MN = +87.2m. Toronto L = +22.2m. La Paz M = +99.0m. Andalgalá ME = +43.0m. Pilar PN = +20m.3s., MN = +46.6m.

Feb. 7d. Records also at 0h. (Helwan), 1h. (La Paz), 2h. (Manila), 22h. (Manila and San Fernando).

Feb. 8d. 18h. 48m. 40s. Epicentre 44° 0'N. 13° 0' E.

A = +.701, B = -.162, C = -.695.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	'	m. s.	s.	m. s.	s.	m.	m.
Pola	1.0	35	e 0 26	+11	—	—	e 0.7	0.6
Rocca di Papa	2.2	185	0 42	- 8	1 10	+ 9	—	1.7
Monte Cassino	2.6	167	1 1	+20	—	—	—	2.5
Zagreb	2.8	50	1 2	+18	i 1 16	- 1	(1.9)	2.1
Milan	3.1	298	0 27	?	2 15	!L	(2.2)	2.6
Moncalieri	3.9	281	0 58	- 3	(1 33)	-14	1.6	—
Zurich	4.6	317	e 1 3	- 8	i 2 12	+ 6	i 2.3	—

Additional records: Pola MN = -1.1m. Zagreb S = +1m.55s. Zurich ePV = +1m.2s., iSN = +2m.11s. The record of Pola is given at 19h. instead of 18h.

Feb. 8d. Records also at 0h. (Batavia and Helwan), 4h. (Manila), 15h. (Batavia), 16h. and 20h. (Taihoku), 21h. (Taihoku and San Fernando).

1918. Feb. 9d. 12h. 28m. 5s. Epicentre 41° 5'N. 28° 0' E.

A = -.661, B = -.352, C = -.662; D = +.470, E = -.883;

G = -.585, H = -.311, K = -.749.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	'	m. s.	s.	m. s.	s.	m.	m.
Athens	4.9	224	e 1 0	-16	—	—	i 1.2	1.4
Budapest	8.7	316	e 2 34	-22	—	—	—	—
Zagreb	9.7	300	e 2 42	-16	i 4 28	+ 7	i 5.3	5.8
Pompeii	N. 10.2	271	i 2 27	- 6	e 4 31	- 4	—	—
	E. 10.2	271	i 2 27	- 6	e 4 38	+ 3	e 7.4	—
Graz	10.5	306	3 0	+23	—	—	—	—
Monte Cassino	10.6	274	2 32	- 6	—	—	—	6.7
Vienna	10.6	313	i 3 7	+29	—	—	—	—
Pola	10.8	293	e 3 13	+32	e 4 31?	-19	e 5.8	5.9
Rocca di Papa	11.4	276	i 2 38	-12	4 19?	-45	—	5.1
Helwan	12.0	166	5 43	?	(5 43)	+24	(8.2)	12.4
Milan	11.2	293	e 4 8	+39	—	—	—	10.3
Potsdam	14.8	322	e 4 55	+79	—	—	—	—
Zurich	15.0	300	e 3 18	-21	—	—	—	—
Hohenheim	15.0	305	—	—	—	—	e 7.2	—
Moncalieri	15.1	290	e 4 4?	+24	7 16?	+42	8.6	11.2
Uccle	18.7	308	—	—	—	—	e 10.5	—
De Bilt	18.8	312	—	—	—	—	9.9	11.5
San Fernando	26.9	270	3 25	?	8 55	-104	13.2	14.9

Additional records: Rocca di Papa MN = +4.8m. Zagreb iPNW = +3m.23s., MNW = +6.5m., MNW = +8.8m., also four other i's. Helwan records L as S. Moncalieri MN = +9.5m. De Bilt MN = +11.7m. San Fernando MN = +17.4m.

Feb. 9d. 20h. 46m. 18s. Epicentre 25° 6' N. 134° 1' E.

A = -0.628, B = +0.648, C = +0.432; D = +0.718, E = +0.696;
G = -0.301, H = +0.310, K = -0.902.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°		m. s.	s.	m. s.	s.	m.	m.
Kobe	9.1	5	2 10	- 7	(3 42)	-24	3.7	3.8
Osaka	9.2	7	2 17	- 2	---	---	3.9	5.0
Zi-ka-wei	12.5	300	i 3 5	- 1	e 5 29	- 3	---	---
Mizusawa	N. 14.8	22	2 5	?	3 40	?P	---	---
	E. 14.8	22	2 5	?	3 30	?P	---	---
Manila	16.5	231	---	---	e 5 30	?	---	---
Batavia	41.4	224	---	---	e 14 42	+15	---	---
Honolulu	61.8	78	---	---	---	---	e 25.1	25.6
Helwan	87.6	302	19 42	?	---	---	---	---
Zagreb	89.3	322	10 58	?	---	---	---	---
Milan	93.1	325	11 9	---	---	---	---	21.4
Monte Cassino	93.2	320	11 24	?	---	---	---	20.7
Rocca di Papa	93.7	320	i 11 22	?	14 33?	?P	e 20.7	---
La Paz	157.4	71	19 1	[-64]	(33 54)	---	33.9	35.6

The La Paz record suggests that T_0 should be considerably diminished (it is taken above from Zi-ka-wei), and the epicentre moved further away from Japan.

Additional record: Osaka MN = +4.8m.

Feb. 9d. Records also at 2h. (Colombo), 3h. (Helwan and Monte Cassino), 5h. (Manila), 8h. (Helwan), 11h. (Mizusawa), 12h. (Pompeii), 13h. (Manila), 21h. (Mizusawa), 22h. (La Paz).

Feb. 10d. Records at 0h. (San Fernando), 2h. (Rocca di Papa), 5h. (Taihoku), 10h. (Zi-ka-wei and Manila), 11h. (Rocca di Papa), 12h. (Athens), 15h. (Helwan, La Paz, and Algiers), 18h. (Manila), 19h. (Taihoku), 20h. (San Fernando), 23h. (Zagreb and Mizusawa (2)).

Feb. 11d. 2h. 59m. 45s. Epicentre 39° 0' N. 23° 0' E. (as on 1918 Jan. 20).

A = +0.715, B = +0.304, C = +0.629; D = +0.391, E = -0.920;
G = +0.579, H = +0.246, K = -0.777.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°		m. s.	s.	m. s.	s.	m.	m.
Athens	1.2	151	0 32	?S	(0 32)	- 1	0.8	1.0
Rocca di Papa	8.4	294	e 2 12	+ 5	---	---	---	5.2
Zagreb	8.5	325	e 2 27	+18	---	---	i 5.2	7.0
Pola	9.0	313	---	---	---	---	e 5.0	6.0
Moncalieri	12.8	303	e 2 37?	-33	---	---	8.9	---

No additional records.

Feb. 11d. Records also at 8h. (Taihoku), 10h. (Athens, Helwan, and Zagreb), 11h. (Pola), 12h. (Zagreb), 20h. (Zagreb), 21h. (San Fernando).

1918. Feb. 12d. $\left\{ \begin{array}{l} 1\text{h. } 25\text{m. } 11\text{s. (I)} \\ 19\text{h. } 14\text{m. } 2\text{s. (II)} \\ 20\text{h. } 4\text{m. } 0\text{s. (III)} \\ 20\text{h. } 9\text{m. } 7\text{s. (IV)} \end{array} \right\}$ Epicentre $32^{\circ}\text{N. } 110^{\circ}\text{W.}$

A = -291, B = -794, C = -533; D = -939, E = +344;
G = -183, H = -500, K = -846.

			Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
					m. s.	s.	m. s.	s.	m.	m.
Tucson	N.	(I)	0.6	275	0 39	2L	—	—	1.0	1.1
	E.		0.6	275	0 13	+ 4	(0 25)	+ 8	0.4	1.0
	N.	(II)	0.6	275	—	—	—	—	5.1	5.3
	E.		0.6	275	—	—	—	—	5.0	5.7
	N.	(III)	0.6	275	1 19	2L	—	—	1.5	1.7
Berkeley	E.		0.6	275	0 52	2L	—	—	1.3	1.7
	(I)		11.5	302	e 2 49	- 3	—	—	—	—
	(II)		11.5	302	e 2 58	+ 6	—	—	—	—
St. Louis	(III)		11.5	302	2 0	-52	—	—	—	—
	(I)		17.4	63	—	—	1 5 35	?	6.3	—
Victoria	(IV)		17.4	63	—	—	—	—	10.2	—
	(II)		19.0	332	—	—	—	—	16.5	—
Ann Arbor	(III)		19.0	332	4 38?	+ 9	—	—	8.6	11.1
	(IV)		23.2	57	6 29	2PR ₁	8 29	-60	9.2	9.4
Washington	(I)		27.5	66	5 49	-14	—	—	6.3	—
	(II)		27.5	66	e 5 32	-31	—	—	16.2	—
Georgetown	(IV)		27.5	66	e 6 32	0	1 10 50	0	e 12.3	—
	(I)		30.1	62	1 7 42	2PR ₁	—	—	—	—
Fordham	(II)		72.4	34	43 58	2L	—	—	(44.0)	94.8
	(IV)		78.6	34	—	—	—	—	e 31.7	44.0
Moncalieri	(IV)		84.4	39	—	—	—	—	e 46.3	—
	(IV)		107.9	34	63 53	2L	—	—	(63.9)	—

Additional records: Eskdalemuir ($\Delta = 72.7$) gives 20h.41m. to 20h.54m.
Tucson (I) LN = -14.1m., LE = -14.1m., MN = -14.6m., ME = +14.4m.,
suggesting another movement. Tucson (II) LN = -16.6m., LE = +16.8m.,
MN = +17.5m., ME = -18.4m. Moncalieri (IV) e = -39.2m. Georgetown (IV) ePN? = +6m.5s., iSN = -10m.45s., eLN = +12.6m. Fordham
iPN = +7m.37s.

1918. Feb. 12d. $\left\{ \begin{array}{l} 1\text{h. } 39\text{m. } 55\text{s. (I)} \\ 19\text{h. } 33\text{m. } 0\text{s. (II)} \\ 20\text{h. } 19\text{m. } 28\text{s. (III)} \end{array} \right\}$ Epicentre $41^{\circ}\text{N. } 80^{\circ}\text{W.}$

A = +131, B = -743, C = -656.

			Δ	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Toronto	(I)		2.7	—	—	—	—	1.4	—
	(II)		2.7	(0 42)	0	—	—	0.7	—
	(III)		2.7	—	—	(i 1 14)	- 1	i 1.2	4.0
Ithaca	(I)		2.9	—	—	(e 1 25)	+ 5	e 1.4	—
	(III)		2.9	e 0 53	+ 8	(e 1 30)	+10	e 3.6	—
Georgetown	(II)		3.0	e 0 37	-10	—	—	1.5	—
Washington	(II)		3.0	0 39	-8	1 35	+12	—	—
	(III)		3.0	(0 47)	0	—	—	0.8	—
Cheltenham	(I)		3.3	0 44	- 8	—	—	—	1.9
	(II)		3.3	0 52	0	—	—	1.7	1.9
	(III)		3.3	0 37	-15	—	—	—	1.8
Ottawa	(I)		5.4	—	—	—	—	e 2.0	2.1
	(II)		5.4	e 1 41	+18	—	—	e 2.1	—
	(III)		5.4	e 1 14	- 9	—	—	e 1.8	2.5
Northfield	(I)		6.3	—	—	—	—	—	—
	(III)		6.3	—	—	e 2 32	-20	—	—

Additional records: Ottawa eLN = 19h.17m. to 19h.50m. Ithaca (III)
eLN = 1m.30s. taken as S., and eN = 1m.1s. Ann Arbor P? =
1h.38m.18s., L = 1h.38m.48s., M = 1h.39m.12s. Washington (III) gives
P = 20h.18m.50s. — earlier than T₀.

Feb. 12d. 3h. 0m. 43s. Epicentre $4^{\circ}5'N$, $95^{\circ}5'E$.

A = -096, B = +092, C = +079 ; D = +095, E = +096 ;
 G = -008, H = +078, K = -097.

	Δ s.	Az. s.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Batavia	15.5	134	e 2 40	-66	—	—	—	7.3
Colombo	15.8	279	3 17	-32	—	—	—	12.3
Bombay	25.4	305	10 4	?S	(10 4)	-26	—	—
Manila	27.0	66	e 6 5	+ 7	—	—	—	—
Zi-ka-wei	36.1	39	e 7 15	- 8	—	—	—	—
Riverview	64.9	131	—	—	—	—	e 27.2	—
Helwan	65.5	301	25 17	?SR ₁	—	—	—	—
Vienna	79.4	318	e 12 17	+ 2	—	—	—	—
Zagreb	79.4	316	e 12 22	- 7	—	—	—	12.6
Graz	79.9	317	e 12 7	-11	—	—	—	—
Rocca di Papa	81.7	312	12 31	+ 2	—	—	—	—
De Bilt	86.7	322	—	—	e 23 46	+ 8	e 54.3	—
Bidston	91.4	324	52 23	?L	—	—	(52.4)	57.6
La Paz	160.0	232	20 8	[0]	—	—	—	—

Additional records : Eskdalemuir (Δ -91.2) gives from 3h.46m. to 4h.5m.**1918. Feb. 12d. 22h. 46m. 34s. Epicentre $2^{\circ}5'S$, $11^{\circ}1'W$.**

A = +080, B = -092, C = -044 ; D = -092, E = -081 ;
 G = -043, H = +008, K = -099.

	Δ s.	Az. s.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
San Fernando	39.2	6	9 26	?PR ₁	15 56	?	20.7	23.4
Coimbra	42.8	3	—	—	e 14 14	-31	22.0	—
Tortosa	44.6	12	9 5	+35	—	—	23.4	26.1
Barcelona	45.6	14	—	—	—	e 23.3	—	—
Pompeii	49.1	26	e 9 16	+15	—	—	—	—
Rocca di Papa	49.2	23	e 8 57	- 4	16 8	- 1	e 27.9	28.4
Moncalieri	50.4	17	e 4 16?	?	i 16 19	- 5	24.7	—
Helwan	51.8	48	17 26	?S	(17 26)	+45	—	—
Paris	52.7	11	—	—	—	e 31.4	—	—
Zagreb	53.9	23	e 9 30	- 2	—	—	28.4	34.4
Hohenheim	54.2	16	—	—	—	e 27.9	—	—
Kew	54.7	8	—	—	—	—	—	29.4
Uccle	54.9	12	—	—	e 16 50	-30	28.4	—
Vienna	56.1	22	e 9 44	- 3	—	—	—	—
De Bilt	56.3	12	9 58	+10	17 36	- 2	27.4	29.4
Bidston	56.3	6	17 38	?S	(17 38)	0	—	29.4
Stonyhurst	56.8	6	—	—	—	—	—	32.4
La Paz	57.8	252	9 57	-1	19 15	+79	25.8	28.6
Eskdalemuir	58.2	5	17 52	?S	(17 52)	- 9	27.6	—
Edinburgh	58.8	5	23 26	?L	—	—	(23.4)	35.9

Additional records : Rocca di Papa eL = +25.9m. Zagreb MNW = +32.4m.
 De Bilt MN = +34.0m., T₀ = 22h.46m.59s., epicentre $1^{\circ}2'N$, $17^{\circ}3'W$.
 La Paz M = +31.4m. Perth (Δ = 119°.1) records from 22h.40m.58.3s. to 7h.15m.24.2s. Graz T₀ = 22h.46m.48s.

Feb. 12d. Records also at 2h. (Tueson), 6h. (Zagreb), 10h. (Harvard and Edinburgh), 11h. (Manila and Batavia), 19h. (Ann Arbor and Washington), 20h. (Taihoku).

1918. Feb. 13d. 2h. 31m. 26s. Epicentre 5°·6S. 102°·0E.

A = -·207, B = +·973, C = -·098; D = -·978, E = +·208;
G = +·020, H = -·095, K = -·995.

	\angle	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Batavia	4·8	98	i 1 17	+ 3	i 2 2	-10	—	2·4
Colombo	25·4	299	4 4	?	—	—	10·6	20·5
Manila	27·6	43	e 6 2	- 2	11 14	+22	15·3	17·3
Kodaikanal	29·1	303	12 10	?S	(12 10)	+51	17·1	18·2
Bombay	37·8	311	8 4	-28	—	—	—	25·2
Zi-ka-wei	41·2	26	7 52	-13	e 14 2	-22	—	26·9
Simla	43·7	329	14 40	?S	(14 40)	-18	—	27·4
Adelaide	44·6	136	7 46	-44	—	—	—	28·7
Mauritius	45·2	247	9 46	+72	15 34	+16	—	24·0
Melbourne	50·5	136	—	—	(17 10)	+45	28·6	32·7
Osaka	51·2	36	9 13	- 1	20 2	?SR ₁	29·3	34·6
Riverview	53·5	129	i 16 55	?S	(i 16 55)	- 8	e 27·4	33·2
Sydney	53·5	129	6 10?	?	—	—	32·3	34·1
Helwan	76·3	303	11 58	+ 1	—	—	—	—
Zagreb	91·2	316	e 13 24	- 2	i 24 23	- 3	57·6	—
Vienna	91·3	318	e 13 23	0	—	—	—	—
Pompeii	91·8	311	e 24 44	?S	(e 24 44)	+11	—	—
Pola	92·6	315	—	—	e 24 10	-31	e 54·6	59·1
Triest	92·8	316	e 17 34	?PR ₁	—	—	—	—
Rocca di Papa	93·2	312	e 13 55	+22	(e 24 37)	-10	e 24·6	27·6
Hohenheim	96·0	319	—	—	—	—	e 57·1	—
Moncalieri	97·0	315	e 18 18?	?PR ₁	38 33?	?	52·8	—
De Bilt	98·7	322	—	—	24 30	-73	47·6	69·5
Uccle	99·2	321	—	—	—	—	e 55·6	—
Paris	100·5	319	—	—	—	—	e 47·6	—
Honolulu	101·3	69	—	—	(25 34)	-34	e 25·6	—
Kew	102·0	321	—	—	—	—	—	73·6
Edinburgh	103·1	326	24 34	?S	(24 34)	-111	—	72·6
Eskdalemuir	103·2	326	e 24 58	?S	(24 58)	-88	44·9?	69·6
Bidston	103·5	324	26 34	?S	(26 34)	+ 5	—	61·7
San Fernando	108·0	306	e 59 4	?L	65 4	?L	(65·1)	78·6
Coimbra	109·2	311	—	—	—	—	e 65·6	—
Victoria	122·5	34	—	—	—	—	84·0	—
Ottawa	140·2	357	—	—	—	—	e 80·6	—
Toronto	142·0	2	—	—	—	—	82·0	107·2
Harvard	142·8	352	—	—	—	—	e 71·6	—
Ithaca	143·2	358	—	—	—	—	e 83·8	—
Washington	146·7	359	—	—	—	—	e 86·1	—
Georgetown	146·7	359	—	—	—	—	90·8	—
La Paz	155·8	204	17 40	-40	31 50	?	77·2	81·4

Additional records: Manila MN = +19·3m. Mauritius MN = +21·5m.
Zi-ka-wei MN = +24·3m. Melbourne S = +21m.52s., SR₂ = +25m.52s.
Osaka MN = +35·8m. Riverview eS? = +22m.15s. These records are
given as 3h. De Bilt eE = +27m.10s., MN = +68·3m. Epicentre 5°·0S.
105°·0E. Edinburgh M = +78·8m. Eskdalemuir S = +33m.28s., M =
+70·4m. Bidston S = +33m.58s., probably SR₁. Graz T₀ = 2h.32m.0s.
San Fernando MN = +82·6m. Toronto L = +88·6m. Harvard LN =
+83·6m. and +93·0m.

1918. Feb. 13d. 6h. 7m. 10s. Epicentre 24°·0N. 116°·5E.

A = -·408, B = +·817, C = +·407; D = +·895, E = +·446;
G = -·181, H = -·364, K = -·914.

	\angle	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tailhook	4·7	76	1 23	+10	—	—	2·7	—
Zi-ka-wei	8·4	30	2 2	5	e 3 42	- 5	—	—
Manila	10·3	155	e 2 49	-15	1 10	+ 2	—	—
Kobe	19·4	52	i 1 41	7	(8 9)	- 1	8·2	13·9
Osaka	19·6	53	4 26	-10	—	—	8·2	12·2
Mizusawa	25·7	48	5 35	-10	10 3	-13	—	—
Calcutta	25·9	272	5 36	+ 9	11 38	?SR ₁	15·6	21·1
Batavia	31·7	199	6 26	-18	—	—	—	17·8
Simla	35·4	291	6 44	-33	12 20	-41	18·8	22·9
Colombo	39·1	250	7 50	+ 3	—	—	11·1	34·1
Kodaikanal	39·7	256	7 26	-26	—	—	25·9	30·0

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Bombay		40.9	272	7 48	-14	—	—	14.9
Adelaide		62.5	160	18 50	?S	(18 50)	-5	46.0
Riverview		66.5	149	e 11 23	+28	i 19 33	-11 e	26.4
Sydney		66.6	149	10 50?	-5	—	—	31.8
Melbourne		67.3	156	—	—	—	20.0	20.8
Mauritius	N.	72.1	237	21 20	+1S	(21 20)	+29	31.0
	E.	72.1	237	21 26	?S	(21 26)	+35	—
Lemberg		73.4	317	e 13 20	?PR ₁	e 21 38	+31	38.9
Helwan		74.4	296	—	—	—	—	65.8
Athens	N.	77.6	306	12 10	+5	22 2	+6 e	33.5
	E.	77.6	306	12 5	0	—	—	45.8
Honolulu		77.6	72	e 21 56	?S	(e 21 56)	0 e	35.8
Potsdam		78.9	322	e 12 20	+8	—	—	46.1
Zagreb		79.9	316	e 12 19	+1	i 22 28	+6	42.8
Pola		81.6	316	e 12 26	-2	e 21 44	-58 e	39.1
Pompeii	N.	83.1	312	e 12 40	-3	e 25 50	? e	31.8
	E.	83.1	312	e 12 40	-3	—	e	32.8
De Bilt		83.3	325	—	—	22 59	-1 e	37.8
Zurich		83.8	320	e 12 38	-3	—	—	45.0
Rocca di Papa		83.8	313	12 35	-6	e 22 16	-51 e	41.5
Dyce		84.0	332	e 12 48	-6	23 16	+8	33.3
Milan		84.3	318	13 12	+28	45 6	?L	(45.1)
Uccle		84.4	324	e 12 39	-5	e 23 8	-4	37.8
Besancon		85.3	320	—	—	—	—	46.8
Moncalieri		85.5	318	12 54	+3	23 22	-3	35.2
Eskdalemuir		85.6	330	12 46	-5	23 31	+5	36.8
Stonyhurst		86.1	329	18 2	?	i 21 38	?	42.6
Paris		86.5	323	e 12 52	-4	i 23 32	-4	35.8
Kew		86.5	326	22 50	?S	(22 50)	-46	—
Bidston		86.7	329	12 44	-13	23 32	-6	—
Marseilles		87.8	317	e 13 17	-13	e 22 47	-63	46.8
Victoria		90.0	35	24 0	?S	(24 0)	-14	39.4
Barcelona		90.8	317	e 16 0	?	24 14	-8	40.5
Tortosa		92.1	317	13 21	-7	24 29	-7	37.9
Algiers		92.7	313	e 16 42	?	23 20	-82	37.8
Granada		96.8	316	e 16 23	?PR ₁	28 15	?	—
Berkeley		97.0	43	—	—	e 25 50	+24	—
Coimbra	N.	97.9	321	e 21 17?	?	30 40?	?	47.6
	E.	97.9	321	—	—	32 22?	?SR ₂	—
San Fernando		99.0	317	23 50	?	41 50	?	54.8
Ottawa		109.6	9	e 15 14?	+19	27 32	+8	53.2
Toronto		110.7	12	—	—	—	e	37.7
Ann Arbor		111.1	16	15 20	+17	25 8	?	51.8
Northfield		111.3	7	—	—	—	e	53.8
Ithaca		112.4	10	e 18 18	?PR ₁	28 20	+31	52.6
St. Louis		112.5	22	—	—	—	e	52.9
Harvard		113.2	6	20 54	?PR ₁	28 35	+39	54.7
Fordham		114.4	9	—	—	—	e	51.8
Georgetown		115.7	12	e 19 5	?PR ₁	—	—	57.1
Washington		115.7	12	e 20 20	?PR ₁	(e38 35)	?SR ₁	55.3
Cheltenham		116.0	12	57 50	?L	—	—	(57.8)
La Paz		171.3	31	20 23	[- 8]	34 32	—	56.8

Additional records : Osaka MN = +11.1m. Kobe MN = +14.2m. Mizusawa PN = +5m.34s., SN = +10m.1s. Riverview i = +19m.45s., PS = +20m.10s. Lemberg +15m.8s. Zagreb iPN = +12m.30s., iPNW = +12m.36s., T₀ = 6h.7m.18s. Pola MN = +47.6m. De Bilt eSR₁ = +28m.50s., eE = +33m.50s., eN = +34m.20s., MN = +47.6m., Epicentre 24° 0'N, 116° 0'E. Uccle MN₁ = +48.0m. Moncalieri MN₁ = +51.9m., T₀ = 6h.7m.34s. Eskdalemuir SR₁ = +29m.42s., SR₂ = +32m.25s. Victoria S = +32m.22s., MZ = +59.8m. San Fernando MN = +66.8m. Ottawa PR₁ = +19m.38s., SR₁ = +35m.32s., LR = +128.8m., PR₂ = +22m.32s., SR₂ = +39m.50s., eL = +54.8m. Toronto L = +52.9m., iL = +61.1m., eL = +64.1m. Ann Arbor SN = +28m.44s., LN = +52.9m., MN = +63.0m. Northfield L = +69.4m. Ithaca e = +20m.40s., eN = +35m.30s. Harvard eN? = +13m.3s., e = +30m.41s., SR₁? = +36m.57s., SR₂ = +44m.52s., eLN = +54.4m., LN = +55.0m. Hohenheim T₀ = 6h.7m.22s. Vienna T₀ = 6h.7m.18s. Graz T₀ = 6h.7m.21s. Budapest T₀ = 6h.7m.42s.

Feb. 13d. 8h. 27m. 17s. Epicentre $25^{\circ}0'N$. $123^{\circ}0'E$. (as on 1917 July 4d. 0h. & 5h.).

A = -494, B = +760, C = +423; D = +839, E = +545;
G = -230, H = +354, K = -906.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.3	274	1 24	?	—	—	2.4	2.8
Manila	10.6	191	e 2 37	-1	4 45	0	6.6	6.7
De Bilt	85.8	327	—	—	—	—	47.7	49.0
Eskdalemuir	87.5	333	—	—	—	—	45.7	—

Manila gives MN = +7.3m. A previous shock, for which $T_0 = 8h.8m.7s.$ is recorded at Taihoku. A better epicentre would be about $25^{\circ}0'N$. $125^{\circ}0'E.$, but it is as well to take an old epicentre.

1918. Feb. 13d. 20h. 25m. 14s. Epicentre $24^{\circ}5'N$. $126^{\circ}5'E$.

as on 1917 August 5d. 18h.).

A = -541, B = +731, C = +415; D = +804, E = +595;
G = -247, H = +333, K = -910.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Zi-ka-wei	8.0	330	2 13	+12	3 54	+17	—	5.1
Manila	11.3	205	e 3 4	+15	5 24	+22	6.7	7.2
Osaka	12.7	35	—	—	5 19	-18	9.2	14.8
Mizusawa	19.1	35	6 13	?	—	—	10.6	—
Colombo	47.9	257	22 46	?L	—	—	(22.8)	—
Kodaikanal	48.7	262	24 58	?L	—	—	(25.0)	—
Perth	57.3	191	—	—	—	—	42.9?	—
Helwan	82.2	299	31 46	?	—	—	—	—
Vienna	84.2	321	e 12 46	+3	—	—	—	—
Graz	85.2	320	e 14 58	+129	—	—	—	—
Zagreb	85.6	319	e 12 46	-5	23 4?	-22	43.8	47.8
De Bilt	87.9	328	—	—	23 41	-10	e 43.8	47.9
Hohenheim	87.9	324	—	—	—	—	e 44.8	—
Edinburgh	89.0	334	40 26	?L	—	—	(40.4)	51.0
Uccle	89.1	328	—	—	—	—	e 45.8	47.8
Eskdalemuir	89.4	334	—	—	—	—	42.8	—
Rocca di Papa	89.8	317	e 13 18	+3	—	—	e 49.2	56.2
Bidston	90.7	333	35 10	?L	—	—	(45.2)	50.6
Kew	90.8	330	—	—	—	—	—	57.8
Moncalieri	91.0	320	—	—	—	—	e 42.8	—
Paris	91.3	327	—	—	—	—	e 47.8	48.8
Coimbra	102.8	326	—	—	—	—	e 53.8	—
San Fernando	104.5	322	55 31	?L	—	—	(55.5)	57.8

Additional records: Zi-ka-wei SN = +4m.12s., SME = +4m.12s. Manila
 $T_0 = 20h.25m.26s.$, MN = +7.7m. Osaka MN = +14.6m. Perth L =
+48.8m. Rocca di Papa M = +18.0m. Moncalieri L = +49.4m. San
Fernando MN = +62.8m.

Feb. 13d. 22h. 1m. 36s. Epicentre $24^{\circ}5'N$. $126^{\circ}5'E.$, as above.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	11.3	205	e 3 2	+13	5 26	+24	7.4	—
Riverview	62.9	157	i 6 47	—	(e 19 36)	+36	e 19.6	21.0
Sydney	62.9	157	—	—	—	—	18.6	21.4
Melbourne	64.7	164	e 10 24	-19	16 18	?	20.0	20.9
De Bilt	87.9	328	—	—	—	—	e 59.4	66.5
Edinburgh	89.0	334	65 14	?L	—	—	(65.2)	—
Eskdalemuir	89.4	334	—	—	—	—	53.4	—
La Paz	164.1	63	17 56	—	—	—	—	—

Melbourne $SR_1 = 17m.12s.$ Riverview MN = +21.9m.

Feb. 13d. Records also at 1h. (Perth), 5h. (Sitka), 6h. (Taihoku), 9h. (Manila and Zi-ka-wei), 10h. (Zi-ka-wei (3)), 11h. (Zi-ka-wei), 12h. and 13h. (Zi-ka-wei (2)), 14h. (Zi-ka-wei (4) and Taihoku), 15h. (Zi-ka-wei (2) and Melbourne), 17h. (Zi-ka-wei (4) and Taihoku (2)), 20h. (Taihoku and Zi-ka-wei), 22h. (Batavia), 23h. (San Fernando).

Feb. 14d. Records at 0h. and 1h. (Zi-ka-wei), 2h. (La Paz and Manila), 5h. (Zi-ka-wei), 6h. (Dehra Dun), 7h. (Zi-ka-wei), 8h. (Zi-ka-wei (2) and Taihoku), 11h. (Manila and Zi-ka-wei), 15h. (Helwan and Edinburgh), 17h., 18h., and 19h. (Zi-ka-wei).

Feb. 15d. Records at 2h. (Manila), 6h. (Mizusawa), 7h. (Zi-ka-wei and Barcelona), 9h. (Riverview and Melbourne), 14h. (Zagreb), 15h. (La Paz), 19h. (Moncalieri).

Feb. 16d. Records at 0h. (Zurich), 2h. (Manila and San Fernando), 16h. (Denver), 17h. (Mizusawa), 20h. (Zi-ka-wei).

Feb. 17d. Records at 1h. (San Fernando), 7h. (Mizusawa), 8h. (Manila), 19h. (Zi-ka-wei and San Fernando).

Feb. 18d. Records at 8h. (Zi-ka-wei and Manila), 9h. (Zi-ka-wei and Manila), 11h. (Monte Cassino), 13h. (Zi-ka-wei), 15h. (Osaka), 16h. (Toronto, Georgetown, and Ottawa), 17h. (Helwan), 18h. (La Paz and Taihoku).

Feb. 19d. 11h. 3m. 5s. Epicentre $46^{\circ}5'N$. $13^{\circ}0'E$.

$$A = +.671, B = +.155, C = +.725.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Pola	1.7	i 0 20	- 6	—	—	i 0.5	0.6
Zagreb	2.2	i 0 24	-10	0 39	?	—	0.7
Zurich	3.2	e 1 17	?S	i 2 55	?L (i 2.9)	—	—
Rocca di Papa	4.7	i 1 13	0	2 15	+ 6	—	2.8
Monte Cassino	5.1	i 22	+ 3	—	—	—	—

Zagreb gives iNE = +0m. 25s. Zurich ePN = 1m. 23s., ePV = +1m. 21s., eSN = 2m. 53s., iSV = 2m. 54s. Pola gives its record under 12h. instead of 11h. Rocca di Papa MN = -2.4m.

Feb. 19d. 16h. 19m. 40s. Epicentre $18^{\circ}0'S$. $167^{\circ}0'E$. (as on 1917 May 14d.).

$$A = -.927, B = +.214, C = -.309; D = +.225, E = +.974; \\ G = -.301, H = -.070, K = -.951.$$

	Machine.	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Apia	W.	20.8	82	4 37	-14	9 50	?L (9.8)	11.3	—
Sydney	—	21.3	219	5 2	- 5	9 2	-12	10.9	12.6
Riverview	—	21.3	219	i 4 57	0	e 8 55	+ 5	e 11.5	13.8
Melbourne	M.	27.7	220	5 38	-27	10 44	-11	16.2	17.3
Adelaide	M.	30.4	231	11 26	?S	(11 26)	-15	—	23.1
Perth	M.	48.0	243	6 50	?	14 38	-75	26.5	—
Honolulu	M.	52.2	43	e 16 44	?S	(16 44)	- 2	e 22.3	29.3
Manila	W.	55.9	303	e 10 20	+35	—	—	—	—
Batavia	W.	59.8	273	e 7 20	?	—	—	—	—
Zi-ka-wei	—	65.8	318	—	—	e 18 45	-50	—	—
Berkeley	—	86.6	48	—	—	—	—	e 42.3	—
Colombo	M.	89.4	278	24 20	?S	(24 20)	+13	—	—
Victoria	M.	90.7	39	—	—	—	—	45.9?	54.9
Kodaikanal	M.	92.8	280	25 44	?S	(25 44)	+61	—	—
Mauritius	M.	100.7	245	48 38	?L	—	—	(48.6)	—
Cipolletti	M.	103.2	139	63 14	?L	—	—	(63.2)	74.9
La Paz	Bi.	115.7	119	15 53	-25	29 43	-87	58.6	63.7
Toronto	M.	119.3	49	—	—	—	—	61.3	70.5
Ithaca	B.O.	121.4	51	—	—	—	—	e 61.3	—
Harvard	M.	125.4	50	—	—	—	—	63.3?	—
Helwan	M.	138.0	295	22 20	?PR ₁	—	—	—	—
Vienna	—	141.5	328	e 19 32	[-10]	—	—	—	—
Graz	W.	142.7	328	e 20 44	[60]	—	—	—	—
Zagreb	W.	143.3	326	e 19 42	[- 4]	—	—	—	—
Paris	—	146.7	341	i 19 51	[0]	—	—	84.3	—
Rocca di Papa	Ag.	147.7	323	19 53	[+ 1]	—	—	—	20.3
San Fernando	—	160.6	343	31 50	?S	19 20	?	92.3	111.3

Additional records: Riverview gives iPR₁ = +6m. 4s., i = +9m. 3s., PS = +10m. 20s., MN = +12.1m. Melbourne SR₂ = +14m. 2s., P is given as PR₁, Perth PR = +9m. 13s., SR = +19m. 36s. Mauritius PN = +51m. 50s. La Paz M = +74.1m. Toronto eL = +66.4m. Harvard L? = +102.3m. Stonyhurst M = +93.8m. San Fernando MN = +110.3m.

Feb. 19d. 17h. 14m. 35s. At $27^{\circ}0'N$, $121^{\circ}0'E$. (as on 1917 July 5d. 0h.).

$A = -.459$, $B = +.764$, $C = +.454$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku	2.0	167	0 31	0	—	—	1.0	—
De Bilt	83.2	326	e 13 19	+42	(21 25)	-94	21.4	45.0
Edinburgh	84.6	332	35 25	?L	—	—	(35.4)	40.9
Moncalieri	85.5	319	—	—	24 59	+94	31.9	—
Kew	86.1	328	—	—	—	—	—	43.4
Rio Tinto	98.7	321	22 25	—	—	—	—	42.4

Additional records: De Bilt MN = +24.1m. Eskdalemuir ($\Delta = 85^{\circ}0$)
 17h.38m. to 18h.0m. Ithaca ($\Delta = 108^{\circ}8$) eLN = 17h.21m. Ottawa
 ($\Delta = 106^{\circ}0$) 17h.22m. to 17h.51m.

Feb. 19d. Records also at 0h. (Zagreb), 11h. (Mizusawa and Zagreb), 12h. (Algiers), 14h. (Riverview and Melbourne), 15h. (Zi-ka-wei and Mizusawa), 17h. (Washington), 20h. (Zi-ka-wei), 21h. (Riverview, Melbourne, and La Paz (2)), 22h. (San Fernando, Mizusawa, and Helwan).

Feb. 20d. Records at 0h. and 1h. (Zagreb), 2h. (Zagreb and La Paz), 3h. (Riverview), 5h. (Harvard), 6h. (Harvard, Ottawa, Balboa Heights, Toronto, and La Paz), 9h. (Taihoku and Zi-ka-wei (2)), 15h. (Riverview), 17h. (La Paz and Helwan), 21h. (San Fernando), 22h. (Riverview, Sydney, and Melbourne), 23h. (Helwan).

Feb. 21d. Records at 2h. (Helwan and San Fernando), 4h. (Batavia), 7h. (Mizusawa and Helwan), 8h. (La Paz), 11h. and 15h. (Riverview), 19h. (La Paz), 21h. (Rio Tinto and San Fernando).

Feb. 22d. Records at 1h. (Barcelona and La Paz), 2h. (Taihoku), 16h. (Zurich, Bidston, Colombo, and Manila), 17h. (La Paz), 20h. (Tortosa, Riverview, and Barcelona), 23h. (Colombo).

Feb. 23d. 18h. 2m. 15s. Epicentre $21^{\circ}5'S$, $111^{\circ}5'W$.

$A = -.920$, $B = -.138$, $C = -.366$; $D = -.148$, $E = +.989$;
 $G = +.362$, $H = +.054$, $K = -.930$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	7.6	358	—	—	—	—	3.6	6.2
Riverview	35.1	242	5 27?	-107	e 12 57	0	17.6	21.8
Melbourne	40.8	236	—	—	e 17 45	?SR ₁	22.8	24.2
Andalgala	92.6	121	—	—	46 51	?L	(46.8)	58.6
La Paz	95.8	110	—	—	—	—	51.4	54.4
Toronto	106.1	48	—	—	—	—	60.4	63.0
Ottawa	109.0	48	—	—	—	—	e 59.8	—
Eskdalemuir	145.1	12	—	—	—	—	67.8	—
Barcelona	159.4	13	i 64 27	?L	—	—	(i 64.4)	—

Riverview gives MN = +18.4m.

Feb. 23d. Records also at 0h. (Colombo and San Fernando), 1h. (La Paz), 6h. (Manila, Jamaica, and La Paz), 10h. (Monte Cassino), 15h. (La Paz), 20h. (Riverview), 22h. (Helwan and San Fernando).

1918. Feb. 24d. 23h. 0m. 16s. Epicentre 11° 0'N. 62° 2'W.

A = +458, B = -868, C = +191; D = -885, E = +466;
G = +089, H = -169, K = -982.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		s	m. s.	s.	m. s.	s.	m.	m.
Vieques		7.8	337 (e 2 9)	+11	—	—	e 2.2	5.1
Port au Prince		12.3	309 e 3 5	-2	5 22	-5	—	—
La Paz		28.1	192 i 6 1	-8	11 25	+24	14.4	14.6
Georgetown		30.9	337 e 6 24	-12	—	—	12.3	—
Washington		30.9	337 6 23	-14	11 27	-23	17.2	—
Harvard		32.3	348 —	—	c 12 20	+7	13.8	—
Toronto		35.9	339 —	—	—	—	e 17.2	20.2
Ottawa		36.3	344 —	—	—	—	e 9.7	—
Ann Arbor		36.5	335 —	—	(8 44)	PR ₁	8.7	18.3
Rio de Janeiro	N.	38.7	151 e 7 50	6	12 44	-64	16.9?	20.7
	E.	38.7	151 e 7 56	-12	13 32	-16	16.8	20.2
Andalgala		38.8	186 7 26	-18	—	—	—	42.0
Chacarita		45.7	176 14 44	1/2	(14 44)	-40	(22.5)	28.3
Cipolletti		50.3	186 14 44	1/2	(14 44)	-99	(26.1)	30.7
Rio Tinto		56.2	52 9 44	-3	—	—	—	32.7
San Fernando		56.3	53 —	—	15 44	?	17.7	19.7
Bidston		63.0	35 10 20	-12	—	—	—	28.5
Eskdalemuir		63.5	33 —	—	19 44	+37	—	—
Edinburgh		63.8	32 19 59	1/2	(19 59)	-48	—	40.7
Kew		64.1	38 —	—	—	—	—	38.7
Uccle		66.7	39 c 10 58	+2	—	—	—	—
De Bilt	N.	67.4	38 —	—	19 56	+1	27.7	30.5
	E.	67.4	38 —	—	20 3	+8	28.7	31.0
Rocca di Papa		71.4	50 11 30	+4	—	—	—	12.2
Graz		73.6	44 12 42	-62	—	—	—	—
Zagreb		73.9	45 e 11 38	-3	21 6?	-7	—	—
Vienna		74.2	43 e 11 47	+4	—	—	—	—
Helwan		87.5	60 23 44	1/2	(23 44)	-3	—	—
Capetown		88.5	125 23 2	1/2	(23 2)	-56	—	—
Honolulu		91.3	292 —	—	(23 38)	-49	c 23.6	26.2

Additional records: La Paz M = +14.9m., T₀ = 22h.59m.29s. Harvard
L = +14.3m. Georgetown record is given as 25d., cPN = +6m.25s.,
LN = +12.2m. Toronto L = +14.2m. Andalgala PE = +7m.20s.
Eskdalemuir 23h.20m. to 23h.35m. Zagreb cPNW = +12m.2s., T₀ =
23h.0m.24s.

Feb. 24d. Records also at 0h. (La Paz), 3h. (Helwan), 9h. (Manila and Rio Tinto),
15h. (Riverview and Batavia), 17h. (Helwan).

Feb. 25d. 6h. 3m. 17s. Epicentre 21° 5'S. 171° 5'W. (as on 1918 Feb. 23d.).

A = -920, B = -138, C = -366; D = -148, E = +989;
G = -362, H = -054, K = -930.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		s	m. s.	s.	m. s.	s.	m.	m.
Apia		7.6	358 e 3 13	1/2	(3 13)	-13	3.7	6.0
Riverview		35.1	242 e 7 13	-1	e 12 55	-2	c 14.7	17.2
Sydney		35.1	242 —	—	—	—	15.7	17.3
Melbourne		40.8	236 e 12 43	?	18 43	SR ₁	23.6	25.2
Honolulu		44.8	18 e 15 13	1/2	(e 15 13)	+1	c 22.9	25.7
Adelaide		45.5	241 20 25	1/2	—	—	(20.4)	—
La Paz		95.8	110 —	—	24 15	-59	49.7	52.6
Toronto		106.1	48 —	—	—	—	e 59.9	62.9
Edinburgh		144.5	11 85 13	1/2	—	—	(85.2)	95.2
De Bilt		149.3	3 —	—	—	—	c 86.7	91.7
Helwan		157.9	297 40 43	1/2	(40 43)	?	—	—
San Fernando		160.3	38 —	—	—	—	92.2	96.2

Additional records: Riverview gives MN = +15.9m. Ottawa (Δ = 109° 0').
Long waves began at 7h. De Bilt LN = +85.7m., MN = +90.4m. San
Fernando MN = +95.7m.

Feb. 25d. Records also at 0h. (San Fernando and La Paz), 2h. (Zagreb, Lemberg,
and Rocca di Papa), 3h. (La Paz and Colombo), 4h. (San Fernando),
11h. (Manila (2)), 18h. (La Paz).

Feb. 26d. 10h. 20m. 30s. At $14^{\circ}0'S$, $150^{\circ}0'E$. (as on 1918 Jan. 12d. 18h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	19.8	177	c 4 33	- 6	8 27	+ 8	e 10.5	12.6
Sydney	19.8	177	—	—	8 48	- 29	10.9	11.8
Melbourne	21.2	190	—	—	c 9 30	- 18	17.6	18.7

Riverview gives PS = +8m.45s., MN = +11.2m.

Feb. 26d. Records also at 0h. (Osaka), 2h. (Osaka and San Fernando), 5h. (Perth and La Paz), 10h. (Mizusawa), 12h. (Helwan and La Paz), 13h. (La Paz), 14h. (Helwan), 16h. (Denver), 19h. (San Fernando).

Feb. 27d. 3h. 12m. 15s. Epicentre $16^{\circ}0'S$, $161^{\circ}5'E$. (but see 1918 Feb. 19d. 16h.).

A = - .926, B = + .257, C = - .276; D = + .267, E = - .964;
G = + .266, H = - .071, K = - .961.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Sydney	21.5	212	8 45?	?	(8 45?)	- 10	11.0	11.8
Riverview	21.5	212	c 5 2	3	8 57	+ 2	e 11.2	13.1
Melbourne	27.8	215	—	—	11 15	+ 20	15.2	15.8
Honolulu	52.4	46	c 16 45	?	(c 16 45)	- 1	e 26.8	29.8
Victoria	90.6	39	—	—	—	—	54.9	—
Toronto	119.8	49	—	—	—	—	64.2?	—
Ottawa	122.1	46	—	—	—	—	e 65.8	—
Helwan	135.0	297	25 45	?	—	—	—	—

Additional records: Riverview PS = +9m.15s., MN = +12.0m. Toronto L = - 68.6m. Ottawa LE = +73.8m.

Feb. 27d. 9h. 51m. 45s. Epicentre $5^{\circ}6'N$, $126^{\circ}3'E$. (as on 1918 Feb. 7d. 5h.).

A = - .589, B = + .802, C = + .098; D = + .804, E = - .592;
G = - .058, H = + .079, K = - .995.

	Δ	Az.	P.	O-C.	S.	O-C.	M.
			m. s.	s.	m. s.	s.	m.
Manila	10.1	330	c 2 57	+ 21	5 17	+ 37	7.9
Batavia	22.8	239	1 5 7	- 8	—	—	10.2
Zi-ka-wei	25.9	350	c 5 56	9	10 31	+ 14	—
Helwan	91.5	300	23 15	?	(23 15)	- 71	—
La Paz	162.2	129	20 17	[+ 8]	—	—	—

Zi-ka-wei also gives SMN = +10m.32s. The residuals suggest moving the Epicentre to $4^{\circ}5'S$, $126^{\circ}0'E$.

Feb. 27d. Records also at 1h. and 8h. (La Paz), 9h. (Manila), 12h. (Zi-ka-wei), 15h. (Melbourne, Batavia, and Riverview), 22h. (Denver and San Fernando), 23h. (La Paz).

Feb. 28d. Records at 4h. (Monte Cassino), 7h. (Edinburgh), 21h. (Denver), 23h. (Taihoku).

March 1d. Records at 0h. (Melbourne), 3h. (San Fernando), 7h. (Rocca di Papa), 13h. (Manila), 20h. (Zi-ka-wei and San Fernando).

March 2d. Records at 2h. (Riverview and Manila), 5h. (Helwan), 10h. (Athens), 13h. (Manila), 16h. (San Fernando), 20h. (Capetown).

March 3d. Records at 0h. (San Fernando and Mizusawa), 4h. (Berkeley), 9h. (Helwan), 13h. (Mizusawa), 14h. (Batavia), 19h. and 20h. (Athens).

March 4d. Records at 4h. (Colombo and San Fernando). 14h. (Mizusawa).

March 5d. 21h. 20m. 25s. Epicentre near Taihoku, which gives $P = +17s.$, $S = +31s.$, $L = +1.3m.$, $M = +1.8m.$ Manila gives $e = +3m.35s.$ Zi-ka-wei (after correcting its record by +1h.) gives $eP = +3m.2s.$, $eS = +4m.7s.$, $eL = +4.6m.$, $ME = +4.7m.$

March 5d. Records also at 0h. (Helwan and Mizusawa). 1h. (Melbourne). 6h. and 23h. (San Fernando).

March 6d. Records at 0h. (Rocca di Papa). 6h. (Riverview). 8h. (Tacubaya). 17h. (Manila). 21h. (Monte Cassino and Helwan).

March 7d. Records at 8h. (Taihoku). 9h. (Mauritius, Kodaikanal, and Colombo). 12h. (Algiers). 21h. (San Fernando and Mizusawa). 23h. (Tortosa).

March 8d. Records at 5h. (Manila). 19h. (Helwan). 21h. (Taihoku).

March 9d. Records at 0h. (San Fernando). 8h. (Manila and Mizusawa). 9h. (Mizusawa (2)). 12h. (Rocca di Papa). 18h. (Athens).

March 10d. 14h. 16m. 15s. Epicentre $13^{\circ}0S$. $136^{\circ}0E$.

$$A = -.701, B = -.677, C = -.225; \quad D = -.695, E = +.719; \\ G = +.162, H = -.156, K = -.974.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	25.0	149	i 5 27	-11	i 9 24	-39	e 10.0	10.6
Melbourne	26.0	164	(6 3)	+15	(10 57)	+35	11.0	17.0
Batavia	29.5	279	—	—	e 11 45	-19	—	—
Manila	31.4	331	e 11 53	?S	(e 11 53)	-5	(e 20.8)	—
Helwan	109.1	297	28 45	?S	(28 45)	-8.5	—	—
Rocca di Papa	123.3	312	41 43	?SR ₂	—	—	—	—

Additional records: Riverview +5m.31s., +6m.12s., +9m.40s. Melbourne records P as S and S as L. Manila gives a separate eP, apparently regarded as that of an independent quake, which may be L of this one. Rocca di Papa gives another P at 14h. 59m. 8s., which may similarly be connected with this quake.

March 10d. Records also at 0h. (San Fernando). 1h. (Taihoku). 4h. (La Paz).

March 11d. 16h. 25m. 0s. Epicentre $5^{\circ}0N$. $75^{\circ}0W$. (as on 1917 August 30d.).

$$A = +.258, B = -.962, C = +.087; \quad D = -.966, E = -.259; \\ G = +.023, H = -.084, K = -.996.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	6.0	312	(1 32)	0	—	—	1.5	1.7
La Paz	22.5	163	i 5 21	+10	i 9 32	+17	14.2	18.5
Toronto	38.8	354	—	—	(13 0)	-49	18.4	—
Ottawa	40.4	359	—	—	—	—	e 19.0?	—
Rocca di Papa	85.0	48	e 12 30	-18	—	—	—	73.4
Helwan	101.5	58	60 0	?L	—	—	(60.0)	—

Additional records: Toronto $L = +23.6m.$ Rocca di Papa assumes the M given + one hour wrong. $MN = +72.6m.$; also $L? = +37.2m.$, $M = +53.7m.$ and $+59.2m.$ Balboa Heights gives $P = +44s.$; also $LE = +0.5m.$ and $ME = +0.7m.$

March 11d. 21h. 27m. 23s. Epicentre $44^{\circ}5'N$. $11^{\circ}5'E$. (as on 1916 August 16d.).

$A = +.699$, $B = +.142$, $C = +.701$; $D = +.199$, $E = -.980$;

$G = +.687$, $H = +.139$, $K = -.713$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Pola	1.7	78	0 21	- 5	—	—	0.6	0.7
Rocca di Papa	2.8	161	0 47	- 3	1 21	+ 4	—	1.6
Zagreb	3.4	66	e 0 57	+ 4	1 35	+ 1	—	1.6
La Paz	94.4	251	i 37 13	?L	—	—	(37.2)	—

Additional record: Zagreb iNE = +1m.6s. and iNW = +1m.17s.

March 11d. Records also at 1h. (San Fernando), 2h. (Sydney), 6h. (Riverview and Manila), 9h. and 11h. (La Paz), 13h. (Zurich), 19h. (Rio Tinto), 22h. (Athens).

March 12d. Records at 0h. (San Fernando), 4h. (Helwan), 10h. (Taihoku and Zi-ka-wei), 11h. (Mizusawa), 12h. (Manila), 15h. (Moncalieri), 23h. (San Fernando).

March 13d. 10h. 19m. 55s. Epicentre close to Monte Cassino, which gives $P = +2s.$, $M = +5s.$. Rocca di Papa gives $P = +13s.$, $S = +23s.$, $M = +29s.$

March 13d. Records also at 5h. (Helwan), 12h. (Manila), 14h. (Vicques and Port au Prince), 15h. (Edinburgh), 22h. (Zagreb and Mizusawa).

March 14d. 9h. 29m. 15s. Epicentre $1^{\circ}0'N$. $143^{\circ}5'E$. (as on 1916 Dec. 26d. 20h.).

	Δ	P.	O-C.	S.	O-C.	L.	M.
		m. s.	s.	m. s.	s.	m.	m.
Riverview	35.6	e 7 6	-12	e 13 3?	- 1	e 20.4	24.4
Melbourne	38.9	—	—	15 45	?SR ₁	18.8	24.2
Colombo	63.8	13 45	?PR ₁	—	—	—	—

Riverview gives MN = +21.5m.

March 14d. 19h. 11m. 55s. Epicentre near Athens, which gives $P = +4s.$, $L = +24s.$, $MN = +31s.$, $ME = +33s.$. Rocca di Papa gives eP = +47s., +2m.17s., $M = +4.4m.$. Zagreb eNE? = +1m.53s., $MNE = +4.3m.$, $MNW = +4.9m.$

March 14d. Records also at 0h. (San Fernando), 9h. (Batavia and Colombo), 10h. (Helwan and Manila), 18h. (Lick).

March 15d. Records at 7h. (Rio Tinto), 15h. (La Paz), 19h. (Rocca di Papa).

1918. March 16d. 13h. 37m. 50s. Epicentre 1°0N. 70°0W.

A = +.342, B = -.940, C = +.018; D = -.940, E = -.342;

G = +.006, H = -.016, K = -1.000.

Station.	Machina.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Washington	Mar.	38.4	352	8 30	+49	16 43	? 1.	30.2	
Harvard	B.O.	41.4	359	e 9 24	? PR ₁	14 31	+ 4	e 17.4	
Ann Arbor		43.1	345	17 34	? SR ₁	18 22	? SR ₁	19.6	
Northfield		43.2	357	e 10 10	? PR ₁	(17 46)	? SR ₁	26.2	
Toronto	M.	43.4	350	—	—	(15 16)	-22	i 18.0	18.9
Ottawa		44.7	354	9 12	+41	14 21	-50	18.0	—
Victoria	M.	65.2	324	—	—	—	—	—	22.2
Coimbra	W.	68.0	46	11 15	-11	i 21 3	+ 61	38.7	—
Ro Tinto	M.	68.6	49	20 10	? S	20 10	+ 1	—	31.2
San Fernando	M.	68.6	51	21 10	? S	(21 10)	+ 61	50.7	53.2
Tortosa		74.7	48	11 8	-39	21 32	+10	—	—
Bidston	M.S.	75.7	34	12 22	-29	21 10	-24	—	30.0
Algiers	B.M.	75.9	52	—	—	21 42	+ 6	—	(53.2)
Barcelona		76.0	47	—	—	i 21 43	+ 6	—	—
Eskdalemuir	G.	76.1	33	13 14	? S	22 5	+27	35.2	—
Paris		76.3	40	e 15 10	? PR ₁	i 22 2	+21	48.2	—
Edinburgh	M.	76.4	32	22 10	? S	(22 10)	+28	—	52.2
Kew	M.	76.7	37	—	—	—	—	—	61.2
Uccle		78.9	38	e 12 15	+ 3	22 17	+ 6	—	—
De Bilt		80.1	37	—	—	e 22 21	- 3	e 40.2	44.1
Moncalieri	S.	80.6	44	e 12 47?	+24	i 22 11	-19	39.9	59.5
Rocca di Papa	Ag.	83.9	48	e 17 1	? PR ₁	22 23	-45	—	23.4
Triest		84.9	44	15 22	? S	22 40	-38	—	—
Pola	W.	84.9	45	—	—	e 22 33	+15	46.4	61.8
Zagreb	W.	86.5	44	e 16 18	? PR ₁	22 44	+ 8	34.2	54.2
Vienna		86.9	42	16 28	? PR ₁	22 10	-30	—	—
Helwan	M.	99.3	60	17 10	? PR ₁	—	—	—	68.4
Mauritius	M.	125.7	114	24 52	? S	—	—	—	28.8
Mizusawa	O.	130.7	328	18 7	? S	—	—	—	—
Melbourne	M.	131.2	217	27 10	? S	—	—	—	34.2
Kodaikanal	M.	145.7	70	77 58	? L	—	—	(78.0)	—
Zi-ka-wei		146.0	18	e 19 27	[-23]	—	—	—	—
Columbo	M.	148.9	75	31 10	? S	(31 10)	-42	—	—
Manila		161.0	326	18 23	? S	—	—	—	—
Batavia	W.	174.0	150	e 17 10	? S	—	—	—	—

Additional records: Harvard gives L = +44.7m., T₀ = 13h.40m.54s., Ann Arbor PN = -17m.40s., LN = -19.7m., Ottawa PR₁ = +9m.55s., PR₂ = +10m.10s., L = +26.2m., T₀ = 13h.40m.31s., Pilar records e at 13h.38m.30s., Coimbra iN = -21m.59s., SR = +34m.7s., Algiers LM = +53.2m., San Fernando MN = +51.7m., De Bilt eN = -22m.27s. and +23m.6s., eE = -23m.9s., MN = +43.8m., Epicentre South America, Moncalieri MN = +42.4m., Zagreb iPN = -16m.23s., iPNW = +16m.25s., Mizusawa NS = +18m.10s., Melbourne L = +57.7m., M = +60.8m.

March 16d. Records also at 0h. (Monte Cassino), 13h. and 17h. (La Paz), 18h. (Manila), 22h. (Zagreb).

1918. March 17d. 13h. 12m. 37s. (I)) Epicentre **36° 0' N. 28° 0' E.**
17d. 13h. 45m. 5s. (II))

as on 1917 June 13d.,

A = +714, B = +380, C = +588; D = +470, E = -883;

G = +519, H = +276, K = -809.

Station.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Athens	II	3.9	302	e 1 10	+ 9	e 1 49	- 2	—	2.7
	II	3.9	302	e 1 6	+ 5	e 1 45	- 2	e 2.0	2.7
Helwan	(I) M.	6.7	154	3 41	? L	—	—	(3.7)	—
	II M.	6.7	154	—	—	—	—	—	9.7
Pompeii	II	11.6	298	e 3 25	+32	e 6 25	? L	(6.4)	8.5
Rocca di Papa	(I) Ag.	13.2	301	e 3 40	+24	—	—	8.6	—
	II Ag.	13.2	301	e 3 22	+ 6	e 5 36	-13	e 7.8	8.7
Zagreb	(I) W.	13.3	321	e 3 26	+ 9	—	—	e 9.0	9.0
	II W.	13.3	321	e 3 22	+ 5	—	—	—	9.0
Pola	II W.	13.9	314	e 3 31	+ 6	e 6 7	+ 1	e 8.1	9.6
Lemberg	II B.O.	14.1	350	e 4 7	40	6 36	+26	7.9	11.5
Vienna	II	14.9	329	e 3 42	- 4	—	—	—	—
Milan	II	17.0	309	5 42	? L	7 23	+ 5	—	7.4
Moncalieri	II S.	17.8	307	4 43	- 28	7 58	+22	10.5	14.1
Zurich	II	18.3	314	e 4 23	+ 2	e 7 57?	+10	—	—
Hohenheim	II	18.7	319	e 4 31	+ 6	—	—	—	—
Marseilles	II Ma.	18.8	300	14 25	- 2	e 8 15	+17	11.6	—
Algiers	II B.M.	20.0	280	e 4 35	- 6	8 23	0	—	—
Tortosa	II	22.0	291	4 57	- 8	8 57	- 8	10.0	10.1
Uccle	II	22.5	318	e 5 6	- 5	e 9 16	+ 1	e 12.9	14.9
Paris	II	22.6	313	e 5 8	- 4	19 13	- 4	12.9	16.9
De Bilt	(I)	22.8	322	—	—	e 9 23	+ 2	—	15.9
	II	22.8	322	—	—	9 26	+ 5	11.7	15.8
Kew	II M.	25.3	316	—	—	—	—	—	19.9
Bidston	II M.S.	27.8	319	—	—	—	—	—	16.9
Edinburgh	(I) M.	29.6	323	17 23	? L	—	—	(17.4)	—
	II M.	29.0	323	—	—	—	—	—	18.1

Additional records: Athens (I) MN = -3.1m., T₀ = 13h.12m.57s., (II) T₀ = 13h.45m.21s., Rocca di Papa (II) ME = -14.4m. and +16.4m., Zagreb (I) MNW = -10.4m., (II) iP = 3m.31s., MNW = -9.7m., Pola MN = +9.4m., T₀ = 13h.45m.46s., Moncalieri MN = +14.2m., T₀ = 13h.45m.46s., Zurich T₀ = 13h.45m.2s., Algiers LM = +19.9m., De Bilt (I) MN = +16.8m., (II) MN = +13.7m., Epicentre Rhodes—S.W. Asia Minor., Eskdalemuir 13h.59m. to 14h.26m.

March 17d. Records also at 2h. (San Fernando), 14h. (Riverview and Kodai-kanal), 15h. (Riverview (2)), 17h. (Batavia).

March 18d. Records at 3h. (Rocca di Papa), 4h. (Helwan), 7h. (Bidston).

1918. March 19d. 5h. 55m. 23s. Epicentre 11°·7S. 162°·5E.

A = -·934, B = +·294, C = -·203 ; D = +·301, E = +·954 ;
G = +·193, H = -·061, K = -·979.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Sydney	24·4	203	5 37	+ 5	9 55	- 3	13·5	14·4
Riverview	24·4	203	e 5 30	- 2	i 9 46	- 6	e 13·1	14·5
Melbourne	20·5	208	—	—	i 11 19	-24	18·6	19·5
Adelaide	31·8	219	11 49	?S	(11 49)	-16	—	22·3
Perth	17·4	303	16 5	?S	(16 5)	+19	30·0	—
Manila	48·9	302	e 8 59	0	—	—	—	—
Osaka	53·0	332	9 34	+ 8	17 19	+23	21·7	28·4
Batavia	55·2	275	e 9 37	- 3	—	—	—	—
Colombo	84·3	278	45 37	?L	—	—	(45·6)	—
Berkeley	85·8	310	—	—	—	—	e 37·0	—
Lick	86·0	51	—	—	—	—	e 40·6	—
Kodaikanal	87·3	281	59 19	?L	—	—	(59·3)	—
Victoria	88·5	40	—	—	—	—	43·5	51·3
Cipolletti	110·7	140	—	—	—	—	e 57·4	—
Toronto	118·3	46	—	—	—	—	e 62·4	67·5
Ithaca	120·3	47	—	—	—	—	e 62·4	—
Ottawa	120·4	44	—	—	—	—	e 59·6	—
Georgetown	120·9	51	—	—	—	—	e 61·6	—
Washington	120·9	51	—	—	—	—	e 60·1	—
La Paz	122·5	118	—	—	30 10	+62	58·1	61·4
Harvard	124·4	46	—	—	—	—	62·0	—
Helwan	131·3	300	21 37	?PR ₁	—	—	—	—
Eskdalemuir	135·0	348	—	—	—	—	81·6	—
Graz	135·1	328	—	—	—	—	e 67·6	—
Zagreb	135·6	327	e 22 7	?PR ₁	—	—	68·6	84·6
De Bilt	135·7	340	—	—	—	—	e 66·3	82·3
Bidston	136·7	347	57 1	?L	—	—	(57·0)	74·3
Kew	137·9	344	—	—	—	—	—	100·6
Paris	139·3	340	—	—	—	—	e 79·6	—
Rocca di Papa	140·1	324	e 19 23	[+16]	—	—	—	—
Moncalieri	140·4	332	e 62 8	?L	73 35?	?L	84·2	—
Coimbra	150·4	346	—	—	—	—	e 85·6	—
Rio Tinto	152·2	321	75·37	?L	—	—	(75·6)	100·6
San Fernando	153·3	340	—	—	77 37	?L	87·6	95·6

Additional records: Riverview +5m.40s., PS = +10m.8s., T₀ = 5h.55m.32s.,
MN = +13·9m. Melbourne SR₁ = +14m.55s. Osaka MN = +29·3m.,
T₀ = 5h.55m.17s. Victoria eL = +44·0m., MZ = +46·1m. Toronto
L = +124·3m., 130·5m., 142·2m. Ottawa gives eL from 6h.55m.0s. to
7h.5m.0s. and from 7h.9m.0s. to 7h.28m.0s. Harvard L = +64·0m.,
+80·4m. Zagreb MNW = +88·6m. De Bilt MN = +78·4m., +83·8m.
Epicentre 13°·4S. 164°·5E. San Fernando MN = +94·6m.

March 19d. Records also at 0h. (Ann Arbor), 1h. (La Paz (2)), 2h. (La Paz),
5h. (Edinburgh and Taihoku), 11h. (Taihoku), 13h. (Eskdalemuir), 15h.
(Uccle), 23h. (San Fernando).

March 20d. 1h. 11m. 15s. Epicentre 13°·0S. 166°·8E. (as on 1914 June 26d. 4h.).

A = -·949, B = +·222, C = -·225 ; D = +·228, E = +·974 ;
G = +·219, H = -·051, K = -·974.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	24·8	213	e 5 22	-14	e 10 1	+ 2	e 12·9	18·6
Melbourne	52·1	214	—	—	e 13 45	?SR ₁	16·2	19·7
Adelaide	33·6	224	13 3	?S	(13 3)	+29	—	18·6
Perth	50·3	239	—	—	—	—	25·1	—
Manila	53·2	300	e 9 1	-26	—	—	16·1	16·6
Victoria	86·9	36	—	—	—	—	45·3	49·2
Toronto	116·1	47	—	—	—	—	37·0	—
Helwan	135·6	300	32 45	?	—	—	—	—
De Bilt	138·2	343	—	—	—	—	e 65·2	78·8

Additional records: Riverview PS = +10m.20s., MN = +17·2m. Esk-
dalemuir 2h.33m. to 2h.42m. De Bilt eN = +67·6m., eLN = +73·8m.

March 20d. Records also at 0h. (Kodaikanal). 1h. (La Paz), 2h. (Manila, Toronto, and Bidston), 6h. (Pa Paz), 10h. (Manila), 11h. (Helwan), 15h. (Edinburgh), 22h. (La Paz), 23h. (La Paz and Zagreb).

Mar. 21d. 15h. 50m. 53s. Epicentre $18^{\circ}08'$. $167^{\circ}0'E$. (as on 1918 Feb. 19d.).

A = -0.927, B = +0.214, C = -0.309; D = +0.225, E = +0.974;

G = +0.301, H = -0.070, K = -0.951.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia	20.8	82	e 4 48	- 3	—	—	8.4	—
Riverview	21.3	219	i 4 56	- 1	9 8	-18	11.0	13.8
Sydney	21.3	219	4 49	- 8	9 7	-17	11.4	12.2
Melbourne	27.7	220	—	—	11 1	+ 7	16.8	18.2
Perth	48.0	243	19 27	?SR ₁	—	—	27.4	—
Toronto	119.3	49	—	—	—	—	65.0	95.8
Ottawa	121.7	48	—	—	48 37	?	56.2	—
Helwan	138.0	295	41 7	?SR ₁	—	—	—	—
De Bilt	143.1	342	—	—	46 7	?	75.2	—

Additional records: Riverview gives iS = +9m.3s. Melbourne SR₁ = +13m.55s. Toronto L = +87.8m. and +89.8m.

Mar. 21d. 16h. 9m. 20s. Local European shock $47^{\circ}0'N$. $10^{\circ}0'E$. (as on 1917 Sept. 6d. 21h.). Graz ($\Delta = 3^{\circ}.8$) gives eP = +1m.4s. Zagreb ($\Delta = 4^{\circ}.3$), eP = +1m.6s. Vienna ($\Delta = 4^{\circ}.5$), eP = +1m.4s. Rocca di Papa ($\Delta = 5^{\circ}.6$) P = +1m.20s., M = +1.6m.

March 21d. 16h. 58m. 22s. Epicentre $7^{\circ}5'N$. $79^{\circ}0'W$. (as on 1913 Oct. 2d. 4h.).

A = +0.189, B = -0.973, C = +0.130; D = -0.982, E = -0.191;

G = +0.025, H = -0.128, K = -0.991.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
La Paz	26.3	156	—	—	10 33	+ 5	22.2	29.8
Georgetown	31.5	3	e 6 59	+16	12 29?	+29	e 15.8?	—
Washington	31.5	3	e 7 38	?PR ₁	(e 12 3)	+ 3	e 12.0	—
Ithaca	35.0	3	—	—	e 12 51	- 4	—	—
Ann Arbor	35.1	354	7 20?	+ 6	—	—	23.1	23.1
Toronto	36.1	0	—	—	—	—	20.2	28.3
Ottawa	38.0	4	e 8 21	+43	e 13 42	+ 4	e 21.6	—
Cipolletti	47.5	169	—	—	—	—	e 32.5	—
Edinburgh	75.9	34	17 38	?	—	—	—	—
De Bilt	80.5	38	—	—	—	—	e 43.6	51.3
Helwan	103.6	57	26 38	?S	(26 38)	+ 9	—	—

Additional records: Georgetown gives eN = +6m.57s., eLN? = +15.7m., LN = -20.7m. Ann Arbor PE? = +6m.38s., PN? = -7m.38s., LE = +21.6m., M = +21.6m. Ottawa e = +18m.26s., L = +33.6m. Tacubaya T₀ = 16h.59m.12s.

March 21d. Records also at 0h. (Colombo and San Fernando), 1h. (Rocca di Papa, Toronto, Helwan, and La Paz), 3h. (La Paz, Georgetown, and Ottawa), 4h. (Toronto), 6h. (Bidston and Riverview), 16h. (Toronto), 22h. (Vieques), 23h. (San Fernando).

March 22d. 4h. 43m. 20s. Epicentre $41^{\circ}0'N$. $14^{\circ}0'E$. (as on 1917 April 26d.).

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	1.3	i 0 37	?S	(i 0 37)	+ 1	(1.0)	1.2
Pola	3.9	0 58	- 3	—	—	—	1.3
Zagreb	5.0	e 1 21	+ 4	—	—	—	2.4

No additional records.

March 22d. 5h. 51m. 50s. Epicentre $19^{\circ}8'N$, $103^{\circ}3'E$.

$$A = -.216, B = +.916, C = +.339; \quad D = +.973, E = +.230; \\ G = -.078, H = +.330, K = -.941.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Osaka	32.0	56	6 47	0	(13 43)	28R ₁	13.7	16.8
Helwan	65.1	295	36 10	?L	—	—	(36.2)	—
Vienna	73.3	316	e 11 34	- 4	—	—	—	—
Zagreb	74.1	314	e 11 46	+ 3	21 22	? 7	38.2	48.2
Rocca di Papa	77.4	310	12 4	+ 1	—	—	55.4	—
De Bilt	79.3	322	—	—	20 40	? e	40.2	45.7
Moncalieri	79.9	314	—	—	22 13	- 9	42.2	—
Paris	82.0	319	—	—	—	c	43.2	—
Edinburgh	82.5	327	24 10	?S	(24 10)	+78	—	41.2
Eskdalemuir	82.7	327	—	—	—	—	34.2	—
Ottawa	114.7	359	—	—	—	—	48.2	—
Toronto	116.5	2	—	—	—	—	i 40.8	41.0
La Paz	171.2	291	—	—	—	—	e 73.2	—

Additional records: Osaka MN = +17.6m. Rocca di Papa M = +12.8m.,
L = +59.4m. De Bilt MN = +44.7m., N.E. Asia. Ottawa eL =
+38.7m. Graz T₀ = 5h.51m.42s.

March 22d. Records also at 1h. (Tortosa), 2h. (La Paz), 7h. (Batavia and Athens),
10h. (Mizusawa), 11h. (Riverview and Manila), 14h. (Batavia), 19h.
(San Fernando and Manila), 20h. (La Paz).

March 23d. 0h. 11m. 50s. Epicentre $49^{\circ}0'N$, $144^{\circ}0'E$. (as on 1917 July 16d. 18h.).

$$A = -.531, B = +.386, C = +.755; \quad D = +.588, E = +.809; \\ G = -.611, H = +.441, K = -.656.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Mizusawa	10.1	193	2 27	- 4	4 21	-11	—	—
Osaka	15.6	207	4 13	-26	—	—	7.2	7.4
Manila	39.2	217	e 8 19	+31	(13 23)	-31	13.4	—
Vienna	72.8	327	i 11 35	0	—	—	—	—
De Bilt	73.1	335	—	—	e 21 58	+55	e 37.2	43.5
Graz	74.1	326	i 11 44	+ 1	—	—	—	—
Uccle	74.4	335	i 11 40	- 5	—	—	—	—
Zagreb	75.0	325	i 11 47	- 2	—	—	—	—
Moncalieri	78.6	330	e 12 12	+ 1	(19 34)	? 19.6	—	—
Helwan	81.0	306	22 10	?S	(22 10)	-25	—	—
La Paz	138.4	50	20 6	[+29]	—	—	—	—

Additional records: Osaka MN = +7.5m. De Bilt eLN = +40.2m.
North Japan. Zagreb iPNW = +11m.55s.

March 23d. Records also at 17h. (Zi-ka-wei and Taihoku (2)), 21h. (San Fer-
nando), 22h. (Helwan).

March 24d. 5h. 8m. 40s. Epicentre $18^{\circ}0'S$, $170^{\circ}1'E$.

$$A = -.937, B = +.164, C = -.309; \quad D = -.172, E = -.985; \\ G = +.304, H = -.053, K = -.951.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	23.2	223	i 5 14	- 5	i 9 21	- 8	e 12.2	12.8
Melbourne	29.6	223	—	—	—	—	i 14.5	14.8
Manila	58.4	301	e 10 2	+ 1	—	—	—	—
Osaka	62.1	328	10 23	- 3	—	—	—	20.0
Batavia	62.7	272	10 32	- 2	—	—	—	—
La Paz	113.1	118	e 13 16	-116 (i 17 34)	+ ?	—	—	—
Helwan	140.7	295	28 20	? 2	—	—	—	—
Edinburgh	141.8	354	39 50	28R ₁	—	—	—	—
Zagreb	144.9	338	e 18 52	-81	—	—	—	—
Rocca di Papa	149.4	326	e 18 54	+65	19 33	[-22]	—	19.6

Additional record: Riverview gives PR₂ = +6m.50s., PS = +9m.35s., i =
+12m.37s., i = +14m.52s., MN = +13.3m.

1918. Mar. 24d. 23h. 14m. 54s. Epicentre 34°·5N. 57°·1E.

A = +418, B = +692, C = +566; D = +840, E = -543;
G = +308, H = -476, K = -824.

The Indian residuals indicate an Epicentre further away (by about 1°·5), but this would make the European residuals wrong, unless we make the displacement vertically downwards into the earth. The only evidence as to the depth of focus however, viz., that of La Paz, is in the opposite direction.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Simla	17·2	96	6 24	?	8 36	+1L	10·2	10·6
Bombay	20·9	134	4 59	7	—	—	—	13·6
Lemberg	28·5	312	e 7 18	+65	e 10 48?	-20	—	26·0
Calcutta	29·8	106	8 42	?	11 54	+23	16·3	—
Kodaikanal	30·6	138	16 6	2L	—	—	(16·1)	—
Budapest	31·1	306	6 36	-3	13 6	?SR ₁	—	—
Vienna	33·0	307	i 6 53	-3	—	—	—	—
Zagreb	33·0	303	e 6 52	-4	—	—	22·1	25·1
Graz	33·4	305	6 57	-3	15 24	?L	(15·4)	—
Triest	34·5	302	e 7 12	+3	—	—	—	—
Rocca di Papa	35·3	296	e 7 15	-1	13 5	+5	e 20·9	32·9
Hohenheim	37·8	307	7 33	-3	—	—	—	—
Moncalieri	38·8	301	7 45	+1	16 51	?SR ₁	23·7	29·7
De Bilt	40·6	312	8 0	0	e 14 18	+3	e 26·1	30·5
Uccle	41·0	310	e 7 54	-9	e 17 24	?SR ₁	—	32·1
Paris	42·2	307	e 7 51	-21	—	—	29·1	—
Tortosa	44·5	296	8 33	+3	15 18	+9	18·7	33·3
Bidston	45·5	314	9 11	+34	18 18	?SR ₁	—	33·3
Edinburgh	45·7	317	14 36	?S	(14 36)	-48	—	30·1
Eskdalemuir	45·7	316	8 38	0	15 25	+1	22·8	30·5
Rio Tinto	50·5	293	18 6	?S	(18 6)	+101	—	33·1
Coimbra	51·2	297	e 8 28?	-46	16 56	+22	35·6	—
La Paz	128·1	276	19 25	[+12]	—	—	74·1	69·7

Additional records: Zagreb iPNE = +7m.3s., MNW = +28·1m. Rocca di
Papa P = +7m.14s., M = +7·8m., +9·1m., eL = +25·0m. Moncalieri
MN = -30·0m. De Bilt e = -9m.34s., -17m.15s., MN = +28·8m.
Esdalemuir PR₁ = +10m.31s., SR = +18m.46s.

March 24d. Records also at 1h. (Manila), 2h. (La Paz), 3h. (Monte Cassino and Rocca di Papa), 4h. (Taihoku), 14h. (Riverview), 16h. (Manila), 17h. (Mizusawa and Osaka), 21h. (Batavia), 22h. (Helwan, Melbourne, Riverview, and San Fernando).

March 25d. Records at 0h. (Dehra Dun), 1h. (La Paz), 4h. (Kobe and Osaka), 5h. (De Bilt and Helwan), 13h. (Manila), 17h. (Helwan), 23h. (Helwan and Pompeii).

March 26d. 6h. 13m. 20s. Epicentre 11°·0N. 24°·6E. (as on 1917 Aug. 20d. 23h.).

A = +686, B = +314, C = +656; D = +416, E = -909;
G = +597, H = -273, K = -755.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Athens	3·2	346	e 0 50	0	(1 17)	-11	1·3	1·7
Pompeii	7·6	271	e 1 40	-15	e 3 10	-16	—	—
Zagreb	7·9	311	—	—	e 3 32	-2	—	5·5
Graz	8·9	316	e 2 54?	+39	—	—	—	—
Rocca di Papa	9·0	279	—	—	e 4 7	-4	—	4·3
Vienna	9·3	324	e 3 22	-68	—	—	—	—
De Bilt	17·3	316	—	—	7 35	-10	e 9·9	11·9
Manila	85·1	75	e 37 33	?L	—	—	(e 37·6)	—

Additional records: Zagreb iMNE = +5·2m., MNW = 5·9m. Rocca di
Papa MN = +4·9m. De Bilt epicentre at Ithaca, Greece.

March 26d. Records also at 1h. (Simla and San Fernando), 8h. (Batavia), 12h. (Taihoku), 19h. (Victoria).

1918. March 27d. 3h. 52m. 15s. Epicentre 25°0N. 123°0E.

(as on 1917 July 4d. 0h. and 5h.).

A = -494, B = +760, C = +423; D = +839, E = +545;

G = -230, H = +354, K = -906.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.3	274	0 15	- 5	—	—	0.4	—
Zi-ka-wei	6.3	347	1 35	- 1	2 46	- 6	—	3.8
Manila	10.6	191	e 2 45	+ 7	6 33	?L	8.2	8.8
Osaka	14.5	45	—	—	5 7	-73	—	12.1
Calcutta	31.8	273	9 27	?	18 33	?L	(18.6)	—
Kodaikanal	45.7	259	27 45	?L	—	—	(27.8)	—
Helwan	79.2	298	43 45	?L	—	—	(43.7)	—
De Bilt	85.8	327	—	—	e 22 56	-32	e 42.7	49.6
Uccle	87.0	326	—	—	—	—	e 45.7	56.7
Eskdalemuir	87.5	333	—	—	—	—	40.7	48.1
Moncalieri	88.6	320	—	—	—	—	49.1	—
Bidston	88.8	331	35 45	?	44 3	?L	(44.0)	58.7
Paris	89.2	325	—	—	—	—	e 47.8	56.8
Coimbra	100.8	321	(11 45?)	?	(21 45)	?	—	—
Rio Tinto	101.4	321	54 45	?L	—	—	(51.8)	57.8
San Fernando	102.0	320	—	—	—	—	56.0	62.8
La Paz	166.5	53	20 15	[+ 2]	—	—	—	—

Additional records: De Bilt MN = +49.0m. Osaka gives MN = +12.6m.
 Coimbra gives what appear to be records of an earlier shock, +e1m.15s. and
 -e2m.15s.; also eL = +29m.45s. San Fernando P = 2h.34m.0s. and
 MN = +63.8m.

Mar. 27d. 23h. 11m. 12s. Epicentre 18°0S. 167°0E. (as on 1918 Mar. 21d.).

A = -927, B = +214, C = -309; D = -225, E = +974;

G = +301, H = -070, K = -951.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia	20.8	82	4 45	- 6	—	—	8.8	—
Riverview	21.3	219	i 4 56	- 1	i 8 51	+ 1	e 10.5	11.5
Melbourne	27.7	220	—	—	i 11 0	+ 6	14.9	16.7
Manila	55.9	303	e 10 30	+ 45	—	—	—	—
Paris	146.7	341	—	—	—	—	e 90.9	—
San Fernando	160.6	343	5 48	?	—	—	92.5	109.9

Additional records: Riverview gives P = +5m.7s., PR₁ = +6m.13s., PS =
 +9m.6s., MN = +12.2m. San Fernando MN = +101.8m.

March 27d. Records also at 8h. (Riverview), 12h. (Batavia), 21h. (Paris), 22h. (Sydney and De Bilt).**March 28d. 7h. 37m. 10s. Epicentre 41°0N. 24°6E. (as on 1917 Aug. 20d. 23h. and 1918 March 26d. 6h.).**

A = +686, B = +314, C = +656; D = +416, E = -909;

G = +597, H = -273, K = -755.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	3.2	346	e 0 43	- 7	(1 16)	-12	1.3	1.6
Pompeii	7.6	271	e 2 50	?S	(e 2 50)	-36	—	—
Rocca di Papa	9.0	279	—	—	—	—	3.9	4.4
Moncalieri	12.9	294	—	—	4 41	-61	6.8	—
De Bilt	17.3	317	—	—	e 7 27	+ 2	e 9.8	11.8

Additional records: Athens MN = +1.8m. De Bilt gives Ithaca, Greece,
 as epicentre.

March 28d. Records also at 0h. (Bidston, Edinburgh, De Bilt, and Rio Tinto), 11h. (Edinburgh), 14h. (Paris), 17h. (Riverview), 22h. (Mizusawa).

March 29d. Records at 1h. (San Fernando), 9h. (Bidston), 12h. (Taihoku), 15h. (La Paz), 16h. (Manila), 21h. (La Paz).

March 30d. Records at 0h. (San Fernando), 1h. and 3h. (Helwan), 5h. (Taihoku and Helwan), 15h. (Manila), 17h. (Rio Tinto and Mizusawa), 19h. (La Paz)

March 31d. 0h. 2m. 53s. Epicentre $41^{\circ}0'N$, $24^{\circ}6'E$. (as on 1917 Aug. 20d. 23h., and 1918 Mar. 26d. 6h. and 28d. 7h.).

$$A = +.686, B = +.314, C = +.656; \quad D = +.416, E = -.909; \\ G = +.597, H = +.273, K = -.755.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	3.2	192	e 1 7	+17	i 1 59	+31	e 2.5	2.7
Zagreb	7.9	311	—	—	—	—	8.1	—
Graz	8.9	316	—	—	—	—	e 10.2	—
Helwan	12.4	152	3 7	+ 2	—	—	—	—
Moncalieri	12.9	293	—	—	e 7 16	?L	(e 7.3)	—
De Bilt	17.3	317	—	—	—	—	e 13.1	15.8

Additional records: Moncalieri gives $L = +11.4m$. De Bilt $MN = +13.6m$. Epicentre South-East Europe. A better determination would be obtained by moving the epicentre in a north-east direction so as to leave the distance from Helwan unchanged. The distance of Athens should be increased by one degree. Zagreb gives its record at 21d.

March 31d. Records also at 5h. (Helwan), 8h. (Bombay, Zi-ka-wei, and Calcutta), 10h. (Batavia, Kobe, and Osaka), 12h. (Zi-ka-wei and Monte Cassino), 15h. (Barcelona), 16h. (Tortosa), 18h. (Manila and Tortosa), 19h. (Monte Cassino).

The International Seismological Summary for 1918

(Continued).

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present Number contains the information for April, May, and June, 1918, following on that for January, February, and March, already given. The history of the publication is given in the first few pages of the former Number.

It was intended to print, on the last page of the former Number, the usual copy of Tables in use, for every 1° of distance from the Epicentre. But the matter printed came so near to 40 pages that it was found inconvenient to add this page. As an alternative, the Tables have been expanded, as far as $\Delta = 90^\circ$, to every $0^\circ.1$, and printed in a separate pamphlet, issued herewith. Beyond $\Delta = 90^\circ$ the true P and S begin to fail (though they are occasionally recorded even to large values of Δ : see, for instance, the La Paz records on 1918 January 30, in the last Number), so that tabulation to 1° is considered sufficient at present.

The number of Stations which send records has greatly increased, as may be seen, for instance, by a glance at the Earthquake of May 20d. 14h. This earthquake will also serve to show that none of this information is superfluous, if our knowledge is to advance. In spite of the number of stations, the determination of epicentre and time of occurrence present some difficulties, and the residuals cannot be considered satisfactory. Those of stations near the Epicentre are chiefly negative, and those further away chiefly positive. Displacement of the epicentre cannot reconcile them. The hypothesis of a high focus is suggested by the residuals for Batavia and Manila, but was tried and proved unsuccessful. The key to the solution has not yet been found, but this presentation of the residuals may suggest it to some other investigator. In this and many other cases, after spending a reasonable time on them, it was necessary to print some solution, even if obviously faulty, in order to avoid undue delay in catching up the arrears.

H. H. TURNER.

University Observatory, Oxford,
1923 June 11th.

1918 APRIL, MAY, & JUNE.

April 1d. 10h. 8m. 18s. Epicentre $22^{\circ}0'N$. $123^{\circ}5'E$.

$$A = -.512, B = +.773, C = +.375.$$

	Δ °	Az. °	P. m. s.	O-C. s.	L. m.	M. m.
Taihoku	3.5	330	0 47	- 8	1.3	—
Manila	7.8	198	2 4	+ 6	5.0	—
Zi-ka-wei	9.4	348	2 21	- 1	—	5.3
De Bilt	88.6	328	—	—	47.6	55.3
Edinburgh	90.0	337	—	—	49.7	—

De Bilt also gives MN = 54.8m.

April 1d. 17h. 44m. 5s. Epicentre $33^{\circ}3'N$. $9^{\circ}0'W$.

$$A = +.826, B = -.131, C = +.549; \quad D = -.156, E = -.988;$$

$$G = +.542, H = -.086, K = -.836.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
San Fernando	3.9	35	0 55	- 6	(1 25)	-22	—	2.7
Coimbra	6.9	4	1 43	- 2	2 25	-42	2.7	2.8
Tortosa	10.7	42	2 46	- 6	4 8	-40	—	6.0
Barcelona	12.0	44	—	—	e 5 2	-17	—	—
Moncalieri	17.4	43	—	—	e 7 27	0	—	—
Paris	17.8	26	e 7 49	?S	(e 7 49)	+13	9.2	—
Uccle	20.1	26	e 4 43	+ 1	—	—	e 11.2	—
De Bilt	21.4	24	—	—	—	—	10.1	10.8

San Fernando gives MN = +2.2m. Paris eS = +8m.55s. De Bilt MN = +11.3m.

April 1d. Records also at 0h. (San Fernando), 1h. (La Paz), 8h. (Helwan and Zi-ka-wei), 9h. (De Bilt), 14h. (Monte Cassino and La Paz), 16h. (Monte Cassino), 18h. (Marseilles), 20h. (Lick), 22h. (Lick and Batavia).

April 2d. 3h. 33m. 20s. Epicentre $36^{\circ}0'N$. $138^{\circ}0'E$. (as on 1915 Oct. 8d.).

$$A = -.601, B = +.541, C = +.588.$$

	Δ °	P. s.	O-C. s.	L. m.	M.E. m.	M.N. m.
Nagoya	1.2	17	- 1	—	—	—
Osaka	2.5	63	+43	1.8	2.7	3.6
Kobe	2.7	e 49	+ 7	1.8	—	—
De Bilt	82.7	—	—	e 42.7	50.7	50.4

Tokio ($\Delta = 1^{\circ}5'$) gives P = +2m.0s., S = +3m.52s. It is difficult to reconcile these readings with the others, for it seems clear that if the others are worth anything at all the epicentre must be nearer Nagoya than Osaka and Kobe, and thus must also be within a few degrees of Tokio. If we neglect Nagoya we could get a fair agreement by putting the epicentre at $33^{\circ}5'N$. $128^{\circ}5'E$.

April 2d. Records also at 0h. (San Fernando), 2h. (Zi-ka-wei), 13h. (Paris), 21h. (San Fernando), 22h. (Lick).

April 3d. Records at 1h. (De Bilt, La Paz, and Helwan), 3h. (Manila and Bidston), 5h. (Helwan), 15h. (Batavia).

April 4d. Records at 1h. (Riverview), 12h. (Tortosa), 17h. (Helwan and Manila).

April 5d., 15h. 38m. 5s. Epicentre $42^{\circ}0'N$. $13^{\circ}5'E$. (as on 1915 Jan. 13d.).

$$A = +.722, B = +.173, C = +.669.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Monte Cassino	0.6	0 8	- 1	—	—	—	0.3
Rocca di Papa	0.6	0 12	+ 3	0 22	- 5	—	0.4
De Bilt	11.5	—	—	—	—	e 7.9	8.9
Eskdalemuir	17.2	4 55	+ 48	—	—	—	—
Edinburgh	17.6	4 25	+ 13	—	—	—	—

De Bilt gives $MN = +8.8m$.

April 5d. Records also at 10h. (Manila), 14h. (De Bilt and Bidston), 15h. (Helwan), 17h. (Honolulu), 21h. (Helwan).

April 6d. Records at 0h. (La Paz), 2h. (Athens and San Fernando), 3h. (Zagreb), 4h. (Colombo, Manila, and Batavia), 13h. (Rocca di Papa), 19h. (Manila), 23h. (San Fernando).

April 7d. 15h. 54m. 10s. Epicentre $42^{\circ}0'N$. $13^{\circ}5'E$. (as 1918 April 5d.).

$$A = +.722, B = +.173, C = +.669.$$

	Δ °	P. s.	O-C. s.	S. s.	O-C. s.	M. m.
Monte Cassino	0.6	9	0	—	—	0.3
Rocca di Papa	0.6	i 12	+ 3	i 21	+ 4	0.4
Pompeii	1.5	e 45	?S	(e 45)	+ 2	—

April 7d. Records also at 13h. (Manila).

April 8d. 5h. 14m. 8s. Epicentre $42^{\circ}0'N$. $13^{\circ}5'E$. (as on 1918 April 5d. and 7d.).

$$A = +.722, B = +.173, C = +.669.$$

	Δ °	P. s.	O-C. s.	S. s.	O-C. s.	M. m.
Monte Cassino	0.6	6	- 3	—	—	0.2
Rocca di Papa	0.6	—	—	i 23	+ 6	0.5

April 8d. Records also at 1h. (San Fernando and Colombo), 13h. (Honolulu), 15h. (De Bilt, Helwan, Paris, and Edinburgh), 17h. (La Paz and Manila), 20h. (La Paz), 21h. (San Fernando), 22h. (Athens).

April 9d. Records at 2h. (Sydney), 8h. (Rio Tinto), 17h. (Rocca di Papa), 21h. (La Paz).

April 10d. 1h. 9m. 0s. Epicentre $38^{\circ}3'N$. $76^{\circ}3'W$.

$$A = +.186, B = -.762, C = +.620.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Cheltenham	0.6	0 12	+ 3	—	—	0.5	0.5
Washington	1.0	0 12?	- 3	0 22?	- 6	—	0.6
Georgetown	1.0	i 0 12	- 3	—	—	—	0.5
Ithaca	4.1	e 1 58	?S	(e 1 58)	+ 5	(2.2)	—
Harvard	5.6	2 35	?S	(2 35)	+ 1	(3.3)	3.4
Ann Arbor	6.9	—	—	—	—	2.6	—
Ottawa	7.1	—	—	—	—	e 3.4	—

Additional records: Cheltenham gives $MN = +0.6m$, Georgetown iZ = +13s., MZ = +0.6m. Ithaca records S as P and L as S. Harvard records S as P and L as S, and gives $T_0 = 1h.10m.45s$.

1918. April 10d. 2h. 3m. 44s. Epicentre 44° 0'N. 131° 0'E.

A = -472, B = +543, C = -695; D = +755, E = +656;

G = -456, H = -524, K = -719.

The determination of this epicentre does not seem possible without assuming a very deep focus. La Paz, near the anticentre, supports this quite definitely, and in the following a focal depth 0.070, has been assumed.

Station and Component.	Machine.	Corr. for Focus	—	Azimuth.	P.	O—C.	S.	O—C.	L.	M.
					M. S.	S.	M. S.	S.	M.	M.
Mizusawa	N. O.	-0.6	9.0	119	3 17	+70	4 58	+71	—	—
	E. O.	-0.6	9.0	119	3 16	+69	4 57	+70	—	—
Kobe	O.	-0.8	9.9	160	2 25	+7	—	—	4.0	5.4
Osaka	O.	-0.8	9.9	158	2 28	+10	—	—	4.2	5.4
Nagoya	O.	-0.8	9.9	151	2 20	+2	—	—	—	—
Tokyo	O.	-1.0	10.7	138	2 31	+5	4 22	+1	—	—
Zi-ka-wei	—	-1.9	14.9	214	i 3 14	+1	e 5 23	-21	—	5.9
Taihoku	O.	-2.9	20.5	205	4 3	-9	—	—	7.2	—
Manila	W.	-4.4	30.6	198	e 5 35	-15	9 54	-32	11.2	11.9
Calcutta	O.E.	-5.5	41.0	255	6 58	-20	12 34	-29	—	—
Simla	O.E.	-5.8	43.7	272	6 46	-51	11 28	-129	16.3	16.9
Bombay	O.E.	-6.6	54.3	263	8 53	+1	—	—	—	23.2
Batavia	W.	-6.7	54.7	210	8 43	-11	i 15 33	-21	—	15.8
Kodaikanal	M.	-6.8	57.1	251	16 34	±8	(16 34)	+11	19.8	20.1
Colombo	M.	-6.8	57.9	246	16 22	±8	(16 22)	-10	—	20.4
Lemberg	B.O.	-7.5	66.7	318	i 10 14	+8	i 18 22	+9	e 26.8	27.0
Victoria	M.	-7.5	67.0	42	17 40?	±8	i 17 40?	-37	—	18.6
Dyce	Ma.	-7.8	71.5	337	i 10 47	+11	i 19 27	+18	—	—
Edinburgh	M.	-7.9	72.9	335	13 1	? PR ₁	—	—	—	48.1
De Bilt	—	-7.9	73.2	328	10 51	+4	i 19 35	+6	e 32.3	47.6
Zagreb	W.	-7.9	73.4	319	e 10 48	0	19 34	+3	28.3	29.3
Eskdalemuir	G.	-7.9	73.4	334	e 10 50	+2	20 39	+68	36.0	—
Stonyhurst	M.	-8.0	74.4	332	e 11 34	+40	i 18 16	?	—	18.3
Uccle	—	-8.0	74.5	328	i 10 56	+1	19 45	+1	e 39.3	—
Berkeley	—	-8.0	74.7	50	e 10 59	+3	e 19 54	+8	—	—
Bidston	M.S.	-8.0	75.0	334	12 28	+90	20 4	+14	—	49.9
Pola	W.	-8.0	75.1	320	e 10 53	-6	i 19 52	+1	e 29.0	46.3
Zurich	—	-8.0	75.6	323	11 1	-1	20 0	+3	—	—
Helwan	M.	-8.0	76.1	299	11 16	-11	—	—	—	—
Milan	—	-8.0	76.7	322	11 15	+6	20 7	-3	—	20.1
Paris	—	-8.0	76.8	328	i 11 10	0	i 20 12	0	32.3	36.3
Moncalieri	S.	-8.1	77.8	323	11 10	-5	i 20 19	-3	29.3	32.8
Rocca di Papa	Ag.	-8.1	78.0	319	11 12	-4	—	—	—	14.5
Riverview	—	-8.2	80.0	164	i 11 17	-11	i 20 32	-16	32.6	33.6
Melbourne	M.	-8.3	82.8	170	—	—	(i 21 10)	-10	21.2	21.3
Barcelona	—	-8.3	83.0	323	11 34	-13	i 21 3	-19	31.3	34.3
Tortosa	—	-8.4	84.2	324	11 46	-8	21 14	-21	33.9	34.5
Algiers	B.M.	-8.4	86.5	320	i 11 57	-11	21 26	-35	32.3	35.3
Lawrence	W.	-8.5	87.1	34	i 12 4	-7	e 14 51	? PR ₁	21.6	22.0
Ottawa	—	-8.5	87.5	17	e 12 3	-10	e 21 58	-14	41.3	—
Coimbra	N. —	-8.5	88.3	330	14 6	? PR ₁	i 21 38	-43	31.3	35.8
	E. —	-8.5	88.3	330	e 15 6	? PR ₁	i 22 6	-15	—	—
Toronto	M.	-8.5	88.3	21	—	—	(22 4)	-17	26.0	26.2?
Ann Arbor	W.	-8.5	88.3	24	(11 16)	-62	—	—	11.3	—
Ithaca	E. B.O.	-8.6	90.2	20	21 49	?	e 22 16	-26	—	—
	N. B.O.	-8.6	90.2	20	21 50	?	e 22 18	-24	—	—
San Fernando	—	-8.6	90.7	327	11 16	-75	22 1	-46	32.5	56.8
Harvard	M.	-8.6	91.4	16	—	—	i 22 38	-17	25.2	26.5?
Georgetown	—	-8.6	93.3	22	—	—	22 6?	-70	—	—
La Paz	Bi.	148.2	36	i 18 57	[-56]	—	30 15	?	41.0	43.8
Cipolletti	M.	164.9	77	22 40	? PR ₁	—	—	—	—	43.0

For Notes see next page.

NOTES TO APRIL 10d. 2h. 3m. 44s.

Additional records: Kobe gives MN = +4.2m., Osaka MN = +5.0m. Manila MN = +12.0m., T_0 = 2h.3m.53s. Colombo M = +28.8m. Lemberg T_0 = 2h.3m.53s. Dyce i_1 = +12m.47s., iS = +19m.53s. Edinburgh M = +19.8m. De Bilt i_2 = +20m.3s., e = +22m.52s. and +27m.16s., m = +29m.12s. and +29m.25s., eLN = +36.3m., MN = +46.4m., T_0 = 2h.3m.51s. Zagreb iP = +10m.50s., MNW = +44.3m., T_0 = 2h.3m.50s. Eskdalemuir T_0 = 2h.2m.43s. Stonyhurst says "Doubtful case. Maximum at S." Uccle i_1 = +12m.54s., i_2 = +13m.55s., T_0 = 2h.3m.51s. Berkeley T_0 = 2h.3m.48s. Pola MN = +30.0m., T_0 = 2h.3m.38s. Zurich T_0 = 2h.3m.46s. Moncalieri T_0 = 2h.3m.38s. Paris T_0 = 3h.3m.52s. Riverview S = +20m.39s., SR_1 = +24m.8s., MN = +37.0m., T_0 = 2h.3m.45s. Barcelona T_0 = 2h.3m.48s. Algiers T_0 = 2h.4m.11s. Lawrence P = +12m.3s., MN = +22.1m. Ottawa eN = +21m.33s. and +23m.4s., eLN = +24.8m., LN = +27.3m., and +36.3m. Coimbra T_0 = 2h.8m.24s. Toronto records S as I_1 , also I_2 = +35.1m. San Fernando T_0 = 2h.2m.13s. Georgetown SE? = +21m.47s. La Paz gives T_0 = 2h.9m.17s., and what may be a subsequent shock, in which P = 2h.43m.18s., L = 3h.37m.36s.

The following determination was originally made for this earthquake (1918 April 10d.) without making any allowance for the depth of the focus. It serves to show how difficult it is to obtain a determination without some assumption of the kind.

1918. April 10d. 2h. 3m. 44s. Epicentre 40° 0'N. 110° 0'E.

A = - .262, B = + .720, C = + .643; D = + .940, E = + .342;

G = - .220, H = + .604, K = - .766.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	m.	s.	m.	s.	m.	s.	m.	m.
Zi-ka-wei	12.8	130	i 3 14	+ 4	e 5 23	-16	—	5.9
Tathoku	17.8	143	4 3	-12	—	—	7.2	—
Kobe	20.6	97	2 25	-143	—	—	4.0	5.4
Osaka	20.8	97	2 28	-143	—	—	4.2	5.4
Nagoya	21.8	94	2 20	?	—	—	—	—
Tokyo	23.8	91	2 31	-175	4 22	-318	—	—
Mizusawa	E. 23.9	82	3 16	-131	4 57	?	—	—
	N. 23.9	82	3 17	-130	4 58	?	—	—
Calcutta	25.3	233	6 58	+77	12 34	?L (12.6)	—	—
Manila	27.2	156	e 5 35	-25	9 54	-51	11.2	11.9
Simla	27.9	262	6 46	+39	11 28	+31	16.3	16.9
Bombay	38.3	248	8 53	+73	—	—	—	23.2
Batavia	46.3	184	8 43	+ 1	i 15 33	+ 1	—	15.8
Lemberg	58.3	311	i 10 14	+13	i 18 22	+19	26.8	27.0
Helwan	63.2	288	11 16	- 43	—	—	—	—
Zagreb	64.9	310	e 10 48	- 4	19 34	+10	28.3	29.3
Pola	66.7	310	e 10 53	- 3	i 19 52	+ 6	e 29.0	46.3
De Bilt	67.3	320	10 51	- 9	i 19 35	-19	e 32.3	47.6
Dyce	67.5	327	i 10 47	-14	i 19 27	-29	—	—
Zurich	68.3	314	e 11 1	- 5	20 0	- 6	—	—
Uccle	68.4	319	i 10 56	-11	19 45	-22	e 39.3	—
Milan	69.0	312	11 15	+ 4	20 7	- 7	—	20.1
Eskdalemuir	69.1	326	e 10 50	-22	20 39	+24	36.0	—
Rocca di Papa	69.2	308	11 12	0	—	—	—	14.5
Moncalieri	70.2	313	11 10	- 8	i 20 19	- 9	29.3	32.8
Paris	70.6	318	i 11 10	-11	i 20 12	-21	32.3	36.3
Algiers	78.1	308	i 11 57	-11	21 26	-35	32.3	35.3
Riverview	83.1	147	i 11 17	-80	i 20 32	-146	32.6	33.6
Melbourne	84.2	153	—	—	(i 21 10)	-120	i 21.2	21.3
Berkeley	88.5	39	e 10 59	-129	e 19 54	-244	—	—
Ottawa	94.4	4	e 12 3	-97	e 21 58	?	41.3	—
Ithaca	E. 97.4	5	21 49	?	e 22 16	-194	—	—
	N. 97.4	5	21 50	?	e 22 18	-192	—	—
Harvard	97.6	1	—	—	i 22 38	-174	25.2	26.5?
Georgetown	100.8	6	—	—	22 6?	?PR ₁	—	—
La Paz	156.4	355	i 18 57	[-67]	30 15	?	41.0	43.8

April 10d. Records also at 5h. (Riverview and Melbourne), 10h. (Stonyhurst), 15h. (Riverview and Melbourne), 16h. (De Bilt and Edinburgh), 17h. (Riverview and Melbourne), 18h. (De Bilt and Edinburgh), 20h. (Honolulu), 21h. (Colombo and Manila).

April 11d. Records at 1h. (Colombo), 2h. (Denver), 11h. (Mizusawa), 18h. (Manila).

April 12d. Records at 1h. (Lick and Uccle), 7h. (Rio Tinto (2)), 8h. (Athens), 9h. (Batavia and Marseilles), 10h. (Manila and Tacubaya), 14h. (Cape-town), 16h. (Manila).

1918. April 13d. 0h. 51m. 12s. Epicentre $5^{\circ}0S$. $85^{\circ}0E$.

A = +.087, B = +.992, C = -.087; D = +.996, E = -.087;
G = -.008, H = -.087, K = -.996.

Station and Component.	Machine.	Δ	Azimuth.	P.	O—C.	S.	O—C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Colombo	M.	12.9	337	3 12	0			6.5	9.1
Kodaikanal	M.	16.9	334					8.2	12.6
Batavia	W.	21.8	95	i 4 54	- 9				15.8
Bombay	O.E.	26.7	334	6 7	+12				17.1
Calcutta	N. O.E.	27.8	7	6 30	+24	12 30	?SR ₁	21.1	—
	E. O.E.	27.8	7	6 24	+18	12 24	?SR ₁	20.9	21.5
Dehra Dun	O.	35.9	350	8 18	?PR ₁			17.0	17.5
Simla	O.E.	36.9	349	8 18	?PR ₁	13 0	-22	15.7	18.7
Perth	M.	39.5	137	2 1	?	9 23	?PR ₁	—	—
Manila	W.	40.7	61	e 8 4	+ 3			15.6	—
Taihoku	O.	46.5	48					27.6	30.9
Zi-ka-Wei		50.2	41			e 16 17	- 4	—	41.2
Kobe	O.	61.6	46			e 19 0	+17	—	44.9
Helwan	M.	62.1	308	11 0	+34			31.0	34.8
Melbourne	M.	63.4	130	18 30	?S	(18 30)	-36	26.9	33.7
Riverview		67.5	125	e 12 0?	+59	e 19 30	-26	e 26.9	37.0
Sydney	M.	67.5	125			32 6	?L	—	—
Budapest		77.8	321			e 22 48	+50	—	—
Zagreb	W.	79.2	318	e 12 16	+ 2	22 18?	+ 4	43.8	54.8
Pola	W.	80.3	317	e 12 23	+ 2	e 22 30	+ 3	e 42.5	50.5
Rocca di Papa	Ag.	80.3	314					e 45.4	61.4
Triest	W.	80.7	318			e 20 30	-121	—	—
Moncalieri	S.	84.6	316	12 48	+ 2	23 10	- 5	33.1	50.4
Algiers	B.M.	86.6	307	e 15 40	?	23 38	+ 1	36.8	42.8
De Bilt		87.7	323			23 37	-12	e 45.8	59.3
Barcelona		87.9	312	(e 16 22)	?PR ₁	23 49	- 2	—	66.0
Paris		88.8	319			e 24 1	0	44.8	—
Tortosa		89.1	311	13 7	- 4	24 3	- 1	—	57.0
Kew	M.	90.9	322					—	62.8
Stonyhurst	M.	92.5	324	e 22 30	?	i 29 12	?SR ₁	—	60.3
Bidston	M.S.	92.8	323			50 6	?	67.0	—
Eskdalemuir	G.	93.0	325	e 17 13	?PR ₁	e 24 0	-45	42.8	56.8
Edinburgh	M.	93.1	326	23 38	?S	(23 38)	-68	—	123.3
San Fernando		93.9	306	30 48	?SR ₁			50.6	60.8
Rio Tinto	M.	94.2	308	22 48	?			—	59.8
Coimbra	E. N.	95.8	310	e 16 43?	?PR ₁	26 24?	+70	47.2	59.9
		95.8	310	e 19 55	?	e 26 11?	+57	45.3	56.9
Victoria	M.	130.4	24					79.4	—
Ottawa		136.2	340					76.8	—
Harvard	M.	137.0	334					84.6	—
Toronto	M.	139.0	343					76.1	90.1?
La Paz	Bi.	145.8	230	19 39	-11			74.4	80.2

Additional records: Perth SR = +13m.6s. = S probably. Taihoku records ePS at 0h.50m.49s. Zi-ka-wei PM = +16m.51s. MN = +31.1m. Kobe MN = +38.2m. Riverview MN = +31.2m. Should the Riverview records be diminished by 1m.? this would bring them all into line. Zagreb iP = +12m.24s. iNW = +17m.25s. SNW = +22m.36s. Pola MN = +43.5m. T₀ = 0h.51m.24s. Moncalieri MN = +47.7m. T₀ = 0h.51m.36s. De Bilt PR₁E = +16m.15s. SR₁E = +29m.57s. SR₁N = +30m.5s. MN = +55.9m. Epicentre $6^{\circ}0S$. $85^{\circ}0E$. Eskdalemuir i = +31m.6s. San Fernando MN = +69.3m. The P for this station is given as 0h.22m.0s. Toronto LE = +85.6m. LE = +117.6m. La Paz gives its observations one hour later than those taken for the table.

April 13d. Records also at 0h. (Rocca di Papa), 1h. (Batavia), 5h. (La Paz), 11h. (Batavia), 15h. (Tacubaya), 16h. (Helwan and Mizusawa), 18h. and 19h. (Manila).

April 14d. Records at 0h. (San Fernando), 1h. (Rocca di Papa, Monte Cassino and Zagreb), 7h. (Manila), 8h. (Manila and Sitka), 23h. (La Paz).

April 15d. 8h. 27m. 40s. Epicentre $59^{\circ}2N$, $151^{\circ}0W$.

A = -0.448, B = -0.248, C = +0.859; D = -0.485, E = +0.875;

G = -0.751, H = -0.416, K = -0.512.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Victoria	19.4	111	4 11	-23	—	—	8.2	10.1
z.	19.4	111	4 48	+14	—	—	8.8	9.7
Berkeley	28.2	126	e 6 10	0	—	—	—	—
Ann Arbor	E. 43.6	82	8 32	+ 9	—	—	22.3	23.3
	N. 43.6	82	8 26	+ 3	—	—	23.0	24.9
	E. 43.6	82	8 32	+ 9	—	—	22.5	23.5
	N. 43.6	82	8 32	+ 9	15 2	+ 6	21.9	23.3
Toronto	44.8	77	—	—	—	—	19.4	—
Ottawa	45.4	73	8 35	- 1	15 20	0	21.9	25.3
Ithaca	47.1	76	8 34	-14	15 42	0 e	24.3	—
Washington	49.5	80	9 9	+ 5	16 21	+ 8	21.8?	—
Georgetown	E. 49.5	80	i 9 9	+ 5	16 20	+ 7 e	22.7?	26.1
	N. 49.5	80	i 9 9	+ 5	16 20	+ 7 e	22.4?	26.0
Harvard	49.8	72	e 9 16	+10	16 38	+22	22.4	—
Osaka	52.6	277	11 38	?PR ₁	—	—	—	19.7
Edinburgh	62.1	20	3 20	?	—	—	—	28.8
Zi-ka-wei	62.4	285	e 9 59	-29	—	—	—	—
Eskdalemuir	62.6	20	10 29	0	18 53	- 3	30.3	—
Bidston	64.5	21	10 44	+ 2	19 14	- 5	—	36.2
De Bilt	67.1	16	—	—	19 46	- 5	—	—
Uccle	68.2	17	i 11 2	- 3	e 19 56	- 8	—	—
Rocca di Papa	78.2	12	11 56?	-12	—	—	38.8?	54.8
Rio Tinto	78.6	28	19 20	?	—	—	—	39.3
Helwan	90.9	358	24 20	?S	(24 20)	- 3	—	—
La Paz	100.6	104	e 15 40	+87	26 10	+ 9 e	38.3	—

Additional records: Toronto L = +25.4m. Ottawa PR₁N = +10m.28s., T₀ = 8h.27m.44s. Ithaca PN = +8m.45s., SN = +15m.43s. Georgetown T₀ = 8h.27m.47s. Washington T₀ = 8h.27m.46s. Harvard T₀ = 8h.27m.41s. Eskdalemuir SR₁ = +24m.2s., T₀ = 8h.27m.47s. De Bilt Epicentre $59^{\circ}9N$, $151^{\circ}8W$. Uccle T₀ = 8h.27m.48s.

April 15d. 18h. 38m. 10s. Epicentre $13^{\circ}0S$, $166^{\circ}SE$. (as on 1914 June 26d.).

A = -0.949, B = +0.223, C = -0.225; D = +0.228, E = +0.974;

G = +0.219, H = -0.051, K = -0.974.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia	20.9	95	e 4 56	+ 4	—	—	11.8	—
Sydney	25.2	212	5 38	- 2	—	—	11.8	12.8
Riverview	25.2	212	e 5 26	-14	i 9 33	-34 e	12.0	21.1
Melbourne	31.5	214	10 50	?	14 20	?	15.8	17.1
Manila	53.1	300	—	—	e 16 50	- 7	—	—
Victoria	86.9	39	—	—	—	—	—	56.8
Helwan	135.6	300	95 50	?	—	—	—	—
Moncalieri	143.4	335	e 19 30	[-15]	—	—	—	—

Additional records: Apia i = +5m.23s. Riverview iS = +9m.40s., MN = +22.1m.

April 15d. Records also at 0h. (Athens and Rocca di Papa), 2h. (San Fernando), 4h. (La Paz), 8h. (Taihoku and Zi-ka-wei), 11h. (Edinburgh), 14h. (La Paz), 15h. (Monte Cassino), 18h. (Manila), 21h. (La Paz), 23h. (San Fernando).

April 16d. Records at 0h. (Lick), 2h. (La Paz), 7h. (Rio Tinto), 11h. (De Bilt, Colombo, Bidston, Helwan, Paris, and Kodaikanal), 16h. (La Paz), 17h. (Stonyhurst), 20h. (Zi-ka-wei), 23h. (San Fernando).

April 17d. 2h. 37m. 38s. Epicentre $46^{\circ}0'N$. $130^{\circ}0'W$. (as on 1914 July 21d.).

A = -·447, B = -·532, C = +·719; D = -·766, E = +·643;

G = -·462, H = -·552, K = -·695.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria	5·2	59	0 55	-25	—	—	—	1·9
Toronto	35·3	75	—	—	—	—	29·3	—
Ottawa	37·1	71	—	—	—	—	e 26·4	—
Ithaca	37·8	76	—	—	—	—	e 35·4	—
Harvard	40·6	76	—	—	—	—	e 33·3	—
Edinburgh	68·8	29	38 37	?L	—	—	(38·6)	48·7
Eskdalemuir	69·2	29	—	—	—	—	34·4	—
Stonyhurst	70·7	30	—	—	—	—	—	42·4
Bidston	70·8	30	14 40	?PR ₁	22 4	?SR ₁	—	44·0
De Bilt	E. 74·7	27	—	—	e 21 40	+18	e 34·4	47·4
	N. 74·7	27	—	—	e 27 22	?SR ₁	e 36·4	42·4
Uccle	75·5	28	—	—	—	—	e 40·4	—
Paris	76·6	30	—	—	e 22 22	+38	45·4	57·4
Coimbra	79·3	41	—	—	e 22 38	+23	45·4	—
Graz	82·1	23	e 12 30	-1	—	—	—	—
San Fernando	83·2	42	46 52	?L	—	—	(46·9)	57·9
Zagreb	83·4	23	e 12 38	0	22 58?	-3	52·4	—
Rocca di Papa	86·2	27	e 12 38	-16	—	—	55·9	13·0
Helwan	102·1	17	62 22	?L	—	—	(62·4)	—

Additional records: Toronto L = +32·3m. and +43·6. Ottawa gives eLN from 3h.8m. to 3h.17m. Paris MN = -49·4m. San Fernando L = +52·9m. Victoria record is given 10m. late.

April 17d. 6h. 43m. 40s. Epicentre $46^{\circ}8'N$. $131^{\circ}3'W$.

A = -·452, B = -·514, C = +·729; D = -·751, E = +·660;

G = -·481, H = -·548, K = -·685.

The Victoria records, especially of L and M, suggest an epicentre further from Victoria, but on trial it was found impossible to suit both the European and other American records on this supposition.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria	5·6	70	2 26	?S	(2 26)	-8	4·4	4·9
	Z. 5·6	70	3 0	?S	(3 0)	+26	4·0	4·3
Tucson	N. 21·3	126	5 38	+41	—	—	—	8·7
	E. 21·3	126	5 34	+37	—	—	—	8·8
Lawrence	E. 27·3	93	e 4 17	-104	e 8 22	-144	13·2?	15·2
	N. 27·3	93	e 4 20	-101	e 8 29	-137	11·7	12·8
St. Louis	30·9	90	—	—	i 12 14	+24	e 14·0	—
Ann Arbor	N. 33·6	80	12 20?	?S	(12 20?)	-14	17·5	19·3
	E. 33·6	80	—	—	—	—	17·8	19·3
Toronto	36·0	76	4 14?	-188	(14 20)	+70	i 20·7	21·2
Ottawa	37·9	71	—	—	—	—	e 17·3	—
Ithaca	38·5	76	—	—	—	—	17·6	—
Georgetown	39·7	81	—	—	e 14 0	-2	19·7	—
Northfield	40·3	71	—	—	e 17 55	?SR ₁	21·0	—
Harvard	42·1	73	—	—	e 14 40	+4	e 20·6	—
Edinburgh	68·5	28	21 20	?S	(21 20)	+72	—	41·1
Stonyhurst	70·5	29	—	—	—	—	—	39·3
Bidston	70·6	30	25 20	?SR ₁	—	—	—	38·7
De Bilt	74·3	26	—	—	21 12	-6	e 35·3	41·6
Paris	76·3	29	—	—	e 21 27	-14	37·3	46·3
Coimbra	79·3	41	e 42 16?	?L	—	—	(e 42·31)	—
Moncalieri	81·4	28	—	—	—	—	(e 41·1)	—
Graz	81·7	22	e 12 32	+3	e 22 32	-11	—	—
Triest	82·6	24	—	—	—	—	e 48·3	—
San Fernando	83·3	42	43 20	?L	—	—	(43·3)	53·8
Rocca di Papa	85·9	26	e 18 50	?PR ₁	—	—	53·3	23·3

Additional records: Berkeley and Lick give a series of records from 6h.43m.43s. onwards. Ottawa gives LN = +19·3m. and +24·3m. Ithaca LN = +21·0m. Harvard SE = +17m.43s. (-SR₁). T₀ = 6h.50m.7s. De Bilt MN = +37·7m. Coimbra L = +47·3m. Moncalieri L = +47·5m.

April 17d. 14h. 20m. 25s. Epicentre $40^{\circ}5'N$, $25^{\circ}5'E$.

A = +.686, B = +.327, C = +.649; D = +.430, E = -.903;

G = +.586, H = +.280, K = -.760.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	2.9	208	e 0 45	0	1 20	0	1.6	1.7
Pola	9.6	301	—	—	e 4 23	+ 5	—	4.9
Graz	9.7	316	e 2 12	-14	—	—	—	—
Triest	10.0	305	4 30	?S	(4 30)	+ 1	—	—
Vienna	10.0	323	e 4 41	?S	(e 4 41)	+12	—	—
Moncalieri	13.8	295	—	—	—	—	e 6.6	—
De Bilt	18.1	317	—	—	—	—	9.5	9.8
Paris	18.2	305	—	—	—	—	9.6	—
La Paz	103.4	260	—	—	e 41 35	?	(73.0)	—

Additional records: Athens $iP = +53s.$, $M = +1.9m.$ and $+2.0m.$, $T_0 = 14h.20m.25s.$, Pola $MN = +4.7m.$ It seems improbable that the La Paz record belongs to the above shock.

April 17d. Records also at 0h. (Mizusawa), 2h. (Zagreb and Rocca di Papa), 4h. (Zagreb, Rocca di Papa, and Harvard), 5h. (Osaka), 20h. (Rocca di Papa and Athens), 21h. (Monte Cassino and La Paz), 22h. (San Fernando).

April 18d. 2h. 54m. 45s. Repetition from $42^{\circ}0'N$, $13^{\circ}5'E$. (as on 1918 April 5d.).

A = +.722, B = +.173, C = +.669.

	Δ °	P. s.	O-C. s.	S. s.	O-C. s.	M. s.
Rocca di Papa	0.6	e 7	- 2	17	0	21
Monte Cassino	0.6	20	?S	(20)	+ 3	—

April 18d. 2h. 28m. 40s. (I) } Epicentre $24^{\circ}0'N$, $121^{\circ}0'E$.
 20h. 3m. 45s. (II) } (as on 1916 Nov. 14d.).
 22h. 14m. 45s. (III) }

A = -.470, B = +.783, C = +.407; D = +.857, E = +.515;

G = -.210, H = +.349, K = -.914.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
II Taihoku	1.1	24	0 18	+ 1	—	—	0.6	0.7
III	1.1	24	0 18	+ 1	—	—	0.6	0.7
III Hokoto	1.4	252	0 19	- 2	—	—	—	—
II Zi-ka-wei	7.2	3	1 46	- 3	e 3 0	-15	—	4.4
III	7.2	3	—	—	2 26	-49	—	4.4
II Manila	9.4	180	e 2 35	+13	—	—	—	—
I Kobe	16.3	46	—	—	7 56	+55	8.9	9.4
III	16.3	46	—	—	8 31	+89	9.2	10.3
I Osaka	16.5	46	8 12	?L	—	—	(8.2)	10.0
III	16.5	46	8 39	?L	—	—	(8.6)	9.9
I Tokyo	20.0	—	6 49	+128	6 57	-86	—	—
III	20.0	—	7 49	+188	8 3	-20	—	—
III Mizusawa	22.8	44	—	—	9 27	+ 6	—	—
I Sydney	64.6	153	6 28?	?	(19 20)	0	19.3	20.3
II De Bilt	85.6	326	—	—	—	—	e 46.3	—
II Edinburgh	87.2	332	48 15	?L	—	—	(48.3)	63.2

Additional records: Osaka gives for (I) $L = +9.1m.$, $MN = +9.8m.$, and for (III) $L = +9.6m.$, $MN = +10.0m.$ Kobe (I) $MN = +10.0m.$, (III) $MN = +9.3m.$ Mizusawa $E = +10m.7s.$, $N = +10m.6s.$ The Tokyo records (S closely following P in each case) suggest an origin close to Tokyo; but if so this must be a separate shock. The solution as a whole is, however, far from satisfactory, though nothing better was found.

April 18d. Records also at 9h. (Barcelona), 12h. (Honolulu).

April 19d. Records at 0h. (San Fernando), 3h. (Athens), 6h. (Coimbra), 7h. (Apia), 12h. (Bidston), 13h. (La Paz), 14h. (Taihoku), 15h. (Georgetown), 17h. (Barcelona).

April 20d. Records at 6h. (Toronto), 7h. (Rio Tinto and Victoria), 17h. (Monte Cassino), 21h. (San Fernando).

1918. April 21d. 22h. 32m. 20s. Epicentre 33° 6'N. 116° 4'W.

A = -370, B = -746, C = +553; D = -896, E = +445;
G = -246, H = -496, K = -833.

Station and Component.		Machine.	Δ	Azinuth.	P.		O-C.	S.		O-C.	L.	M.
					M.	S.	S.	M.	S.	S.	M.	M.
Tucson	N.	B.O.	4.8	104	1	30	+16.	—	—	—	2.8	—
	E.	B.O.	4.8	104	1	38	+24	—	—	—	3.0	4.2
Lick	E.	W.	5.5	310	e 1	28?	+ 3	e 2	18?	-13	i 2.9	3.3
	N.	W.	5.5	310	e 1	25	0	e 2	15?	-16	i 3.0	3.3
	Z.	W.	5.5	310	e 1	26	+ 1	—	—	—	i 3.0	3.0
Berkeley	N.	—	6.4	313	i 1	36	- 2	i 3	1	+ 6	e 3.2	4.2
	E.Z.	—	6.4	313	e 1	36	- 2	2	59	+ 4	e 3.3	3.8
Denver	W.	—	11.0	53	e 1	40	-64	3	40	-74	5.7	5.7
Victoria	M.	—	15.7	343	3	37	-11	6	49	+ 1	8.3	11.1
	Z.	—	15.7	343	3	56	+ 8	8	53	+ 5	8.9	11.6
Lawrence	W.	—	17.8	66	i 4	18	+ 3	7	44	+ 8	9.2	11.5
Tacubaya	—	—	20.9	129	4	55	+ 3	—	—	—	—	12.2
St. Louis	W.	—	21.6	69	i 5	4	+ 4	9	16	+19	10.9	12.8
St. Boniface	W.	—	21.8	35	6	6	+63	10	1	? L	(10.0)	12.8
Sitka	B.O.	—	26.8	337	e 5	50	- 6	10	38	- 1	e 13.3	17.4
Ann Arbor	E.	W.	27.0	62	5	58	0	10	52	+11	14.7	17.7
	N.	W.	27.0	62	6	4	+ 6	10	46	+ 5	14.5	14.8
	E.	B.	27.0	62	5	58	0	10	40	- 1	14.9	17.1
	N.	B.	27.0	62	6	4	+ 6	10	52	+11	14.1	14.9
Toronto	M.	—	30.3	60	6	46	+15	12	4	+25	17.5	19.6
Washington	Mar.	—	31.9	69	e 6	41	- 5	e 12	5	- 2	15.7?	20.7
Georgetown	E.	—	31.9	69	i 6	44	- 2	12	11	+ 4	e 15.5	17.5
	N.	—	31.9	69	6	37	- 9	12	5	- 2	e 15.5	17.4
	Z.	—	31.9	69	6	42	- 4	12	18	+11	e 15.4	17.2
Cheltenham	B.O.	—	32.0	69	6	52	+ 5	12	9	+ 1	15.0	18.1
Ithaca	B.	B.O.	32.3	62	6	37	-14	12	4	- 9	—	20.1
	N.	B.O.	32.3	62	—	—	—	12	5	- 8	—	17.8
Ottawa	—	—	33.1	57	e 6	52	- 5	12	16	-10	e 15.9	18.7
Northfield	B.O.	—	35.2	60	6	53	-22	12	10	-48	15.8	21.7
Harvard	M.	—	36.3	62	7	25	+ 1	e 13	14	0	e 16.8	22.7
Vieques	E.	B.O.	47.8	94	e 8	57	+ 4	—	—	—	e 29.0	36.8
	N.	B.O.	47.8	94	e 10	52	? PR ₁	—	—	—	e 28.3	31.6
La Paz	Bi.	—	68.0	130	e 11	17	+13	20	20	+18	30.7	31.9
Dyce	Ma.	—	73.7	31	e 12	0	+20	e 21	30	+20	33.7?	41.7
Edinburgh	M.	—	74.1	32	11	40	- 3	—	—	—	—	43.7
Eskdalemuir	G.	—	74.4	33	11	48	+ 3	21	25	+ 6	35.7	40.1
Bidston	M.S.	—	75.6	34	11	46	- 7	21	40	+ 7	—	41.5
Stonyhurst	M.	—	75.7	34	—	—	—	19	4	?	—	41.5
West Bromwich	M.S.	—	76.7	35	12	4	+ 5	21	53	+ 8	—	47.7
Shide	—	—	78.2	36	12	23	+15	22	4	+ 2	32.6	45.7
De Bilt	—	—	80.3	32	12	22	+ 1	22	33	+ 6	e 37.7	46.4
Coimbra	—	—	80.8	47	12	20	- 4	22	37	+ 4	39.3	40.7
Uccle	—	—	80.8	33	e 12	23	- 1	e 22	35	+ 2	e 36.7	49.3
Paris	—	—	81.3	36	e 12	29	+ 2	e 22	48	+10	35.7	44.7
Rio Tinto	M.	—	83.3	48	23	40	? S	(23 40)	—	+40	—	52.7
Besançon	—	—	84.1	35	23	9	? S	(23 9)	0	—	—	41.7
Osaka	O.	—	84.2	308	12	51	+ 8	23	13	+ 3	33.4	41.0
San Fernando	—	—	84.4	49	22	40	? S	(22 40)	-32	—	39.7	48.7
Cipolletti	M.	—	85.2	144	42	10	? L	44	28	?	(42.2)	46.5
Zurich	—	—	85.2	34	e 12	47	- 2	e 23	29	+ 8	—	—
Tortosa	—	—	85.6	43	12	50	- 1	23	33	+ 7	39.5	57.5
Barcelona	—	—	86.1	41	e 12	53	- 1	23	37	+ 6	36.9	52.7
Moncalieri	S.	—	86.5	36	i 23	33	? S	(i 23 33)	- 3	—	42.7	48.0
Marseilles	Ma.	—	86.6	38	—	—	—	e 35	57	?	41.7	48.7
Milan	—	—	86.8	35	—	—	—	22	53	-46	44.7	—
Graz	W.	—	88.5	30	e 13	24	+16	—	—	—	—	—
Triest	W.	—	88.8	32	—	—	—	23	38	-23	—	—
Lemberg	B.O.	—	89.5	24	e 23	58?	? S	(e 23 58?)	—	-11	40.2	51.6

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O - C.	S.	O - C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Pola	W.	89.5	33			e 23 28	-41	e 46.5	49.8
Budapest	—	89.6	28	14 10	56		—		
Rio di Janeiro	M.	89.6	118			e 23 52	-18	46.7	—
Zagreb	W.	89.7	31			e 23 40	-31	38.7	48.7
Algiers	B.M.	89.8	44	e 13 10	-5	24 0	-12	38.7	47.7
Rocca di Papa	Ag.	91.3	35	23 52	? S	(23 52)	-35	e 42.0	58.3
Zi-ka-wei		95.3	313	e 14 38	+53	e 24 20	-49	—	50.3
Athens		99.5	31			e 24 40	-71	e 47.9	52.0
Taihoku	O.	99.7	309			—	—	e 40.4	—
Manila	W.	107.2	302	19 20	? PR ₁	—	—	—	54.2
Accra	M.	108.3	70	29 40	? S	(29 40)	+147	—	66.7
Helwan	M.	109.5	29	24 52	?	—	—	—	73.4
Sydney	M.	109.7	242			—	—	57.1	58.0
Riverview		109.8	242	e 14 34?	-22	e 26 52	-34	e 50.9	52.4
Melbourne	M.	116.0	240			29 46	+88	61.4	63.5
Cape Town	M.	142.8	103	52 58	?	—	—	—	97.0
Mauritius	—	165.6	22	57 40	?	—	—	—	98.8

Additional records: Berkeley gives $T_0 = 22\text{h}.32\text{m}.14\text{s}$. Victoria $T_0 = 22\text{h}.32\text{m}.0\text{s}$. Lawrence SN? = +7m.23s., LN? = +9.6m. = LE?, MN = +10.0m., $T_0 = 22\text{h}.32\text{m}.22\text{s}$. Ann Arbor $T_0 = 22\text{h}.32\text{m}.24\text{s}$. Toronto iS = +13m.22s., iL = +19.3m., $T_0 = 22\text{h}.32\text{m}.24\text{s}$. Washington MN = +17.7m., $T_0 = 22\text{h}.32\text{m}.13\text{s}$. St. Louis $T_0 = 22\text{h}.32\text{m}.8\text{s}$. Georgetown $T_0 = 22\text{h}.32\text{m}.4\text{s}$. Sitka $T_0 = 22\text{h}.32\text{m}.7\text{s}$. Cheltenham $T_0 = 22\text{h}.32\text{m}.32\text{s}$. Ithaca $T_0 = 22\text{h}.32\text{m}.4\text{s}$. Ottawa SR₁N = +13m.54s., $T_0 = 22\text{h}.32\text{m}.24\text{s}$. Northfield MN = +20.2m., $T_0 = 22\text{h}.32\text{m}.33\text{s}$. Point Loma records 22h.33m. Harvard L = +19.2m. and $T_0 = 2\text{h}.32\text{m}.24\text{s}$. La Paz $T_0 = 22\text{h}.32\text{m}.24\text{s}$. Dyce eS = +22m.18s., M = +44.9m. De Bilt MN = +44.2m., $T_0 = 22\text{h}.32\text{m}.29\text{s}$. Coimbra LN = +38.5m., $T_0 = 22\text{h}.32\text{m}.21\text{s}$. Uccle MN₂ = +44.4m., MZ₁ = +43.4m., $T_0 = 22\text{h}.32\text{m}.29\text{s}$. Paris MN = +39.7m., $T_0 = 22\text{h}.32\text{m}.28\text{s}$. Osaka MN = +39.7m., $T_0 = 22\text{h}.32\text{m}.47\text{s}$. San Fernando MN = +49.2m. Zurich $T_0 = 22\text{h}.32\text{m}.22\text{s}$. Barcelona $T_0 = 22\text{h}.32\text{m}.27\text{s}$. Moncalieri S = +34m.46s., MN₁ = +47.2m. Pola MN = +48.7m. Algiers $T_0 = 22\text{h}.32\text{m}.37\text{s}$. Athens MN = +57.0m. Riverview PS = +28m.36s., eSR₁ = +34m.34s., and +36m.16s., MN = +55.4m. Melbourne SR₁ = +36m.34s., SR₂ = +41m.40s. Mauritius NM = +98.0m.

April 21d. 23h. 23m. 0s. Epicentre $47^\circ 0\text{N}$. $98^\circ 0\text{E}$.

$$A = -.095, B = +.675, C = +.731.$$

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Simla	22.5	233	5 18	+ 7	—	—	—	14.5
Bombay	34.8	227	12 49	? S	(12 49)	- 3	—	—
Kodaikanal	40.7	214	8 0	- 1	—	—	23.9	27.7
Colombo	43.0	210	14 6	? S	(14 6)	-42	27.3	34.5
Apia	100.2	100	—	—	(26 0)	+ 2	26.0	—

Simla gives MN = +13.3m. Colombo M = +43.5m.

April 21d. Records also at 4h. (Kodaikanal), 8h. (Rio Tinto and Kodaikanal), 20h. (Zi-ka-wei), 23h. (Cipolletti and Fordham).

April 22d. Records at 1h. (Uccle, Triest, Graz, Osaka, Zi-ka-wei, and De Bilt), 4h. (Vieques), 5h. (Helwan), 7h. (La Paz), 17h. (Helwan), 22h. (Denver).

April 23d. 15h. 27m. 0s. Epicentre $4^{\circ}0'S$, $122^{\circ}6'E$. (Celebes). Epicentre adopted from De Bilt. It does not suit Manila records unless S is one minute in error.

$$A = -.538, B = +.840, C = -.070.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	15.8	261	3 57	- 8	—	—	—	11.0
Manila	18.7	355	e 4 24	- 1	7 0	-55	7.9	8.5
Perth	28.7	191	11 0	?S	(11 0)	-12	—	—
Melbourne	39.5	152	—	—	21 12	?	25.4	27.1
Riverview	40.0	143	e 13 36	?S	(e 13 36)	-31	e 21.4	25.9
Colombo	44.1	282	18 0	?	—	—	—	30.0
Kodaikanal	47.3	287	28 54	?L	—	—	(28.9)	—
Helwan	93.2	300	25 0	?S	(25 0)	+13	—	—
De Bilt	109.8	325	—	—	—	—	e 58.0	62.9
Eskdalemuir	113.0	329	—	—	—	—	58.0	—

Additional records: Manila gives $T_0 = 15h.28m.12s$. Melbourne $SR_1 = +23m.18s$. Riverview $MN = +25.3m$. De Bilt $eLN = +57.0m$.

April 23d. Records also at 0h. (Monte Cassino), 3h. (San Fernando), 12h. (Monte Cassino), 13h. (Rio Tinto), 18h. (Monte Cassino), 19h. (La Paz), 20h. and 21h. (Monte Cassino), 23h. (San Fernando).

April 24d. 14h. 21m. 20s. Epicentre $46.4N$, $10.0E$.

$$A = +.679, B = +.120, C = +.724; \quad D = +.174, E = -.985; \\ G = +.713, H = +.126, K = -.690.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Milan	1.1	211	0 15	- 2	0 23	- 8	—	0.8
Zurich	1.4	314	i 0 23	+ 2	0 36	- 3	i 1.0	1.0
Moncalieri	2.1	229	0 29	- 4	0 52	- 6	—	1.2
Hohenheim	2.4	347	e 0 48	+11	—	—	—	—
Triest	2.7	106	e 1 1	+19	—	—	—	—
Pola	3.1	120	—	—	—	—	e 1.6	1.9
Graz	3.8	78	1 11	+12	—	—	—	—
Zagreb	4.2	96	e 1 13	+ 8	2 29	+34	—	2.5
Marseilles	4.5	228	1 23	+13	1 49	-15	—	—
Rocca di Papa	5.0	156	1 26	+ 9	—	—	—	3.5
Paris	5.6	299	e 1 26	- 1	—	—	3.1	3.7
Uccle	5.8	322	(e 1 34)	+ 4	e 3 15	+36	—	—
Budapest	6.2	77	—	—	—	—	3.5	—
Potsdam	6.3	17	e 2 16	+40	—	—	—	—
De Bilt	6.5	332	—	—	—	—	e 3.5	4.8
Tortosa	8.8	235	3 40	?S	(3 40)	-18	(4.9)	6.3

Additional records: Zurich gives a number of observations, two Ps and an S on each of the three components in addition to those recorded above. Also $T_0 = 14h.21m.18s$. Moncalieri $MN = +1.1m$, $T_0 = 14h.21m.17s$. Besancon ($\Delta = 2^{\circ}.9$), $P = 14h.21m.0s$, $S = 14h.22m.0s$. Zagreb $i = +1m.16s$. Vienna ($\Delta = 5^{\circ}.4$), records 14h.23m. to 14h.35m. De Bilt $L = +4.6m$, $MN = +4.7m$.

April 24d. Records also at 2h. (Manila), 3h. (De Bilt and Eskdalemuir), 4h. (Mizusawa (2) and Helwan), 16h. (Barcelona and Honolulu), 20h. (Manila).

1918. April 25d. 2h. 22m. 35s. Epicentre 34°5N. 41°8E.

A = +.614, B = +.549, C = +.566 ; D = +.667, E = -.746 ;
G = +.422, H = +.378, K = -.824.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan		10.0	245	2 31	+ 1	6 25	?L	(6.4)	8.8
Athens	E.	15.0	289	4 6	+27	—	—	e 7.3	11.2
	N.	15.0	289	4 10	+31	—	—	e 7.2	11.0
Lemberg		20.1	325	4 42?	0	i 8 7	-18	e 12.9	15.3
Zagreb	N.W.	22.6	308	e 5 10	- 2	e 9 17	0	14.4	14.8
	N.E.	22.6	308	i 5 20	+ 8	i 9 22?	+ 5	—	15.2
Vienna		23.3	314	e 5 19	- 1	—	—	—	—
Pola		23.7	304	e 5 29	+ 4	e 9 45	+ 7	e 15.3	15.7
Rocca di Papa		23.9	297	5 41	+14	10 13?	+31	16.5	—
		23.9	297	e 5 41	+14	9 56?	+14	15.4	16.4
Zurich		27.9	308	e 6 5	- 2	e 11 7?	+10	—	—
Moncalieri		28.0	302	6 10	+ 2	i 13 24	?L	(i 13.4)	20.4
De Bilt		31.4	315	6 37	- 5	11 52	- 6	e 18.4	24.2
Uccle		31.5	313	e 6 25	-18	—	—	—	—
Barcelona		31.7	294	—	—	—	—	e 14.4	22.8
Paris		32.2	309	—	—	e 11 41	-30	—	—
Tortosa		33.0	294	6 53	- 3	12 12	-12	14.5	23.5
Stonyhurst		36.3	316	—	—	—	—	—	22.3
Bidston		36.6	315	23 13	?L	—	—	(23.2)	26.4
Eskdalemuir		37.1	317	7 21	-10	—	—	—	—
Edinburgh		37.2	319	13 25	?S	(13 25)	- 2	—	27.4
San Fernando		38.7	287	18 25	?L	—	—	(18.4)	—
Coimbra		39.8	294	—	—	e 11 51?	?	17.8	—
Capetown		71.8	200	41 1	?L	—	—	(41.0)	43.0
La Paz		115.4	267	53 49	?L	62 49	?	(53.8)	—

Additional records: Athens LE = +9.3m., LE = +5.5m., M = +5.6m.,
Zagreb T_0 = 2h.22m.52s. Pola T_0 = 2h.22m.43s. Moncalieri L = +17.1m.,
MN = +19.3m. De Bilt eN = +12m.9s., m = -12m.16s., MN = +20.0m.,
 T_0 = 2h.22m.34s. The La Paz records probably belong to a subsequent
shock much nearer La Paz, but have been included for comparison.

April 25d. Records also at 2h. (Monte Cassino), 8h. (Stonyhurst and Riverview),
16h. (La Paz (2) and Manila), 17h. (Riverview), 18h. (Batavia), 21h.
(La Paz, Balboa Heights, and Athens), 22h. (Helwan, Riverview, Manila,
Marseilles, La Paz, and Batavia), 23h. (Melbourne).

April 26d. 13h. 14m. 52s. Epicentre 21.1N. 121.7E. (as on 1913 Jan 9d. 2h.).

A = -.490, B = -.794, C = -.360 ; D = -.851, E = -.526 ;
G = -.189, H = +.306, K = -.933.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku		3.9	0	—	—	1 54	- 7	3.0	—
Manila		6.5	186	e 2 46	?S	(e 2 46)	-11	—	—
Zi-ka-wei		10.1	359	e 2 36	+5	—	—	—	—
De Bilt		88.4	327	—	—	—	—	e 49.1	52.2
Uccle		89.5	326	—	—	—	—	—	49.1

Zi-ka-wei gives its record under 14h. instead of 13h. De Bilt gives also MN =
+50.6m.

April 26d. Records also at 18h. (Rocca di Papa), 19h. (La Paz).

April 27d. 10h. 53m. 0s. Epicentre $40^{\circ}0'N$. $20^{\circ}0'E$. (as on 1917 April 26d. 13h.).

A = +.720, B = +.262, C = +.643; D = +.342, E = -.940;

G = +.604, H = +.220, K = -.766.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	3.6	123	e 0 55	- 1	1 29	-10	1.8	2.0
Pompeii	4.2	281	e 1 13	+ 8	e 2 18	+23	—	3.3
Rocca di Papa	5.8	291	e 1 46	+16	2 52?	+13	—	3.8
Zagreb	6.5	335	e 1 38	- 1	—	—	—	4.1
Pola	6.6	319	—	—	—	—	e 3.1	5.0
Budapest	7.5	355	—	—	—	—	e 3.8	—
Graz	7.8	337	e 2 21	+23	—	—	—	—
Milan	9.6	308	4 18	?S	(4 18)	0	(e 5.2)	8.0
Lemberg	10.2	15	—	—	—	—	e 5.8	6.2
Moncalieri	10.3	303	—	—	1 42?	?	5.3	8.3
Helwan	13.7	134	14 0	?	—	—	—	—
Paris	15.2	311	—	—	e 6 0	-37	9.0	9.0
Uccle	15.3	320	—	—	—	—	e 8.0	10.0
De Bilt	15.8	325	—	—	—	—	8.2	10.5
Bidston	20.6	318	9 6	?S	(9 6)	+30	—	19.4
Edinburgh	22.0	324	9 0	?S	(9 0)	- 5	—	—

Additional records: Athens gives $T_0 = 10h.53m.9s.$ Rocca di Papa $e = +1m.5s.$, $M = +3.4m.$, $M = +6.1m.$ Zagreb $M = +4.4m.$ and $M = +5.2m.$ The record is given one hour late. Milan records S as P and L as S, also S ten seconds early. Moncalieri $MN = +7.9m.$ De Bilt $MN = +10.6m.$

April 27d. 14h. 43m. 45s. Epicentre $8^{\circ}7'N$. $83^{\circ}0'W$.

A = +.120, B = -.981, C = +.151; D = -.993, E = -.122;

G = +.018, H = -.150, K = -.989.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
La Paz	29.1	150	e 11 22	?S	(e 11 22)	+ 3	28.2	29.8
Washington	30.7	9	—	—	—	—	e 18.1	—
Georgetown	30.7	9	—	—	13 40?	?SR ₁	e 17.5	—
Ann Arbor	33.6	359	7 15	+14	13 3	+29	17.8	20.2
Ithaca	34.2	8	—	—	—	—	e 18.6	—
Tucson	34.9	316	13 0	?S	(13 0)	+ 6	—	18.2
Toronto	35.1	4	—	—	—	—	18.4	24.0
Harvard	35.3	15	e 8 15?	?PR ₁	12 57	- 3	e 17.3	—
Ottawa	37.3	9	e 7 30?	- 2	e 13 23?	- 5	18.2	—
Victoria	52.2	327	—	—	23 33	?	25.8	28.0
Edinburgh	77.1	34	23 45	?S	(23 45)	+115	—	48.6
Esksdalemuir	77.1	35	—	—	—	—	e 44.2	—
Bidston	77.1	37	34 51	?L	—	—	(34.8)	47.8
Stonyhurst	77.4	37	—	—	—	—	—	47.6
Kew	78.7	39	—	—	—	—	—	49.2
Paris	80.5	42	—	—	e 22 15	-14	e 41.2	50.2
De Bilt	82.0	38	—	—	e 22 38	- 8	e 41.2	49.6
	82.0	38	—	—	—	—	e 43.2	50.2
Moncalieri	84.4	45	e 48 43	?	—	—	52.3	—
Helwan	106.2	55	70 15	?	—	—	—	—

Additional records: Tacubaya ($\Delta = 19^{\circ}0'$) gives $P = +1m.33s.$, $M = +3.7m.$ This would indicate a distance $\Delta -6'$ about, but it may be another and more local shock. La Paz gives $T_0 = 14h.44m.51s.$, $S? = +19m.40s.$ Georgetown $eLN = +17.8m.$ Ann Arbor Bosche record $LN = +17.8m.$, $MN = +21.2m.$ Harvard $L = +20.4m.$, $T_0 = +14h.43m.43s.$ Ottawa $SR_1N = +15m.39s.$, $LN = +21.2m.$ and $+26.2m.$, $T_0? = 14h.43m.50s.$

April 27d. Records also at 3h. (Manila), 7h. (Pompeii and Berkeley), 8h. (Barcelona), 11h. (La Paz), 14h. (Helwan), 20h. (Harvard and La Paz).

April 28d. 11h. 12m. 40s. Epicentre $30^{\circ}5'N$. $82^{\circ}0'E$. (as on 1916 Oct. 14d.).

A = +.120, B = +.854, C = +.508; D = +.990, E = -.139;

G = +.071, H = +.503, K = -.862.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan	43.4	283	8 26	+ 5	14 50	- 4	—	16.4
Zagreb	52.6	307	e 9 17	- 7	—	—	21.3	23.0
Graz	52.7	308	e 9 22	- 2	—	—	—	—
Triest	54.1	307	—	—	—	—	e 22.3	—
Rocca di Papa	55.6	302	—	—	—	—	e 18.4	24.2
Moncalieri	58.5	307	e 11 38	?PR ₁	17 59?	- 6	23.9	27.6
De Bilt	58.6	316	—	—	e 16 47	?	e 25.3	31.9
Paris	61.0	312	—	—	—	—	e 27.3	28.3
Edinburgh	62.6	321	21 20	?	—	—	—	—
Eskdalemuir	62.8	320	—	—	—	—	27.3	—
Bidston	63.2	318	26 2	?SR ₁	—	—	—	36.6
Capetown	88.0	228	36 20	?L	—	—	(36.3)	40.8

Additional records: Moncalieri MN = -28.4m. De Bilt eLN = +23.3m., MN = +27.1m.

April 28d. Records also at 0h. (Helwan), 3h. (San Fernando), 9h. (Rio Tinto), 10h. (San Fernando, Rio Tinto, and Tortosa), 15h. (Mizusawa).

April 29d. Records at 1h. (Pa Paz), 5h. (Mizusawa), 7h. (Rio Tinto), 9h. (Batavia), 11h. (Helwan), 15h. (Edinburgh), 17h. (Marseilles), 23h. (Athens).

April 30d. Records at 7h. (Rio Tinto and Manila), 8h. (Monte Cassino), 11h. (La Paz), 13h. (Colombo), 14h. (La Paz), 17h. (Taihoku, Kobe, and Osaka).

May 1d. 4h. 33m. 12s. Epicentre $35^{\circ}0'N$. $110^{\circ}0'W$.

A = -.280, B = -.770, C = +.574.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Tueson	N. 2.8	0 38	- 6	—	—	—	1.7
	E. 2.8	1 0	+16	—	—	—	1.6
Lick		e 2 33	+ 7	—	—	—	—
Berkeley		2 31	- 3	—	—	—	—
Lawrence	E. 12.4	5 33	?S	(5 33)	+ 4	e 7.8	8.4
	N. 12.4	—	—	—	—	e 7.9	8.4
Victoria		—	—	—	—	7.5	11.4
Toronto		25.0	—	—	—	12.4	—

Point Loma records P at 4h.32m.

May 1d. 4h. 48m. 5s. Epicentre $41^{\circ}0'N$. $77^{\circ}0'W$.

A = +.170, B = -.735, C = +.656.

	Δ	P.	O-C.	S.	O-C.	L.
	°	m. s.	s.	m. s.	s.	m.
Ithaca	1.4	—	—	e 0 47	+ 8	e 1.2
Georgetown	E. 2.1	e 0 28	- 5	—	—	4.1
	N. 2.1	e 0 26	- 7	—	—	4.2
Toronto		3.2	—	—	—	1.5
Ottawa		4.5	e 1 6?	- 4	e 1 55?	2.4
Harvard		4.6	—	e 2 26	+ 20	3.1

Additional records: Ottawa gives L = +6.9m., T₀ = 4h.48m.10s. Harvard gives eE = +2m.55s., SN? = +2m.56s., LN = +3.4m., LE = +6.8m. Washington gives these observations, but fails to record seconds: eP = 4h.48m., eS = 4h.49m., L = 4h.50m.

May 1d. Records also at 0h. (San Fernando), 5h. (La Paz (2)), 6h. and 13h. (Helwan), 14h. (Toronto), 22h. (Lick).

May 2d. 0h. 0m. 45s. Epicentre $14^{\circ}08'$, $174^{\circ}0'W$. (as on 1917 July 11d. 22h.).

$A = -.965$, $B = -.101$, $C = -.242$; $D = -.105$, $E = +.995$;
 $G = +.241$, $H = +.025$, $K = -.970$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Apia	2.2	86	1 0 33	- 1	—	—	0.9	1.2
Riverview	37.2	232	(e 7 33)	+ 1	e 7 33	?P	e 16.0	22.3
Melbourne	43.4	229	—	—	—	—	22.8	26.4
La Paz	100.7	110	45 49	?L	—	—	47.4	48.1
Helwan	151.7	309	109 15	?L	—	—	(109.2)	—
Tortosa	152.8	9	55 29	?L	—	—	55.6	55.6
	152.8	9	56 13	?L	—	—	56.6	56.7

Riverview records MN at +20.8m. Probably the records given by Tortosa and Helwan have no connection with this shock.

May 2d. Records also at 2h. (Washington, Harvard, Taihoku, Georgetown, and Ottawa), 4h. (Ottawa and San Fernando), 7h. (La Paz), 10h. (Zi-ka-wei, Taihoku, and Riverview), 21h. (Rocca di Papa), 23h. (Lick).

May 3d. Records at 0h. (Rio de Janeiro), 10h. (Taihoku (2) and Rocca di Papa), 17h. (Bidston, De Bilt, and Eskdalemuir), 19h. (La Paz).

1918. May 4d. 6h. 6m. 5s. Epicentre $21^{\circ}0'N$. $120^{\circ}0'E$.

(as on 1917 Aug. 14d. 23h.).

$A = -.467$, $B = +.810$, $C = +.358$; $D = +.866$, $E = +.500$;
 $G = -.179$, $H = +.310$, $K = -.934$.

Station and Component.	Machine.	Δ	Azinuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Taihoku	O.	4.3	19	1 44	+37	2 18	+20	3.6	4.7
Manila	W.	6.4	171	e 1 39	+ 1	3 48	+53	4.4	5.2
Zi-ka-wei	—	10.3	7	e 2 19	-15	e 5 5	?L	(5.1)	10.4
Kobe	O.	19.2	41	e 4 18	-13	(8 3)	- 3	8.0	16.4
Osaka	O.	19.3	42	4 19	-14	(8 0)	- 8	8.0	16.2
Tokyo	O.	22.7	45	e 6 30	+77	—	—	—	—
Mizusawa	O.	25.7	40	5 32	-13	9 58	-18	—	—
	O.	25.7	40	5 36	- 9	10 21	+ 5	—	—
Batavia	W.	30.1	208	e 5 55	-34	—	—	—	13.9
Colombo	M.	41.3	257	27 25	?L	—	—	(27.4)	—
Kodaikanal	M.	42.3	262	17 1	?SR ₁	—	—	24.7	29.8
Riverview	—	62.4	151	—	—	(19 7?)	+14	e 31.2	37.5
Melbourne	M.	63.3	158	—	—	e 32 13	?L	(e 32.2)	41.4
Helwan	M.	78.7	297	10 55	?L	—	—	—	—
Zagreb	W.	84.4	318	e 12 44	0	e 23 3?	- 9	47.9	50.9
	W.	84.4	318	i 12 51	+ 7	i 23 13	+ 1	—	59.9
Triest	W.	85.9	319	—	—	23 27	- 2	—	—
Pola	W.	86.1	318	e 12 58	+ 4	e 23 14	-17	e 49.9	54.9
Hohenheim	—	87.2	322	—	—	—	—	43.9	—
De Bilt	—	87.7	326	—	—	23 27	-22	e 43.9	51.3
	—	87.7	326	—	—	—	—	e 42.9	57.4
Rocca di Papa	Ag.	88.3	315	e 12 57	-10	(e 23 47)	- 8	e 23.8	23.9
Uccle	—	88.3	326	e 13 13	+ 4	e 23 31	-30	e 46.9	48.9
Eskdalemuir	G.	89.9	332	13 6	- 9	23 34	-39	41.4	50.0
Moncalieri	S.	89.9	320	—	—	e 23 28	-45	50.0	53.2
Stonyhurst	M.	90.5	329	—	—	i 20 25	?L	—	53.4
Victoria	M.	90.7	37	—	—	—	—	—	67.1?
Paris	—	90.9	325	—	—	e 23 46	-37	45.9	49.9
Bidston	M.S.	91.0	329	21 55	?L	31 7	?SR ₁	—	60.3
Barcelona	—	95.2	319	—	—	—	—	e 52.3	64.4
Tortosa	—	96.9	319	24 16	?S	(24 16)	-69	54.6	64.7
Algiers	—	97.2	314	—	—	—	—	—	59.9
Coimbra	B.M.	102.4	323	e 21 55?	?L	32 55?	?SR ₁	e 51.4	—
Rio Tinto	M.	102.8	320	30 55	?SR ₁	—	—	—	71.9
La Paz	Bi.	171.1	61	20 18	[+ 3]	34 55?	?L	e 86.9	96.2

Additional records: Manila gives MN = +4.7m., $T_0 = 6h.5m.6s.$ Kobe MN = +18.0m. Osaka MN = +18.8m. Riverview gives S as SR₁?, e = +24m.25s., MN = +36.9m. Melbourne L = +40.4m. Pola MN = +57.6m., $T_0 = 6h.6m.15s.$ Eskdalemuir PR₁ = +16m.40s., $T_0 = 6h.6m.41s.$ Moncalieri MN = +55.1m. Barcelona MN = +57.4m.

May 4d. Records also at 4h. (Kobe), 5h. (De Bilt), 7h. (San Fernando), 11h. (Mizusawa), 13h. (Osaka, Rio Tinto, and Mizusawa (2)), 14h. and 15h. (De Bilt), 21h. (Taihoku), 22h. (La Paz).

May 5d. Records at 0h. (San Fernando), 1h. (Helwan), 8h. (Uccle, 12h. (Taihoku), 14h. (Zi-ka-wei), 23h. (La Paz and Mizusawa).

May 6d. 4h. 56m. 55s. Epicentre $36^{\circ}8'N$. $114^{\circ}3'W$. (as on 1915 Oct. 3d. 1h.).

A = -·330, B = -·730, C = +·599; D = -·911, E = +·412;

G = -·246, H = -·546, K = -·801.

Washington and some other stations suggest an origin out in the Pacific. Possibly there were two shocks.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tucson	N.	5·3	147	e 2 15	?S	(2 15)	-10	—	3·7
	E.	5·3	147	—	—	—	—	2·9	3·6
Lick		5·9	279	—	—	—	—	e 5·4	—
Berkeley		6·4	280	—	—	e 2 5	-50	—	10·0
Lawrence		15·2	76	e 3 37	- 5	6 26	-11	8·9	9·6
Ann Arbor	E.	24·1	67	—	—	13 29	?L	(13·5)	14·7
Toronto		27·3	64	—	—	—	—	i 15·5	16·0
Georgetown	E.	29·3	74	—	—	e 15 31	?	17·8	—
	N.	29·3	74	—	—	e 15 32	?	16·3	—
Washington		29·3	74	8 5?	?	14 5?	?	19·1?	—
Ithaca	N.	29·4	67	—	—	e 11 25	+ 1	16·3	—
Ottawa		30·0	61	e 9 19?	?	13 33	?SR ₁	16·1	19·1
Northfield		32·1	62	—	—	e 17 45	?	18·8	—
Harvard		33·4	68	—	—	e 18 14	?	19·2	—
Edinburgh		70·5	34	37 35?	?L	—	—	(37·6?)	46·1
Eskdalemuir		70·8	34	—	—	—	—	33·1	—
Bidston		72·1	36	29 47	?	38 35	?L	(38·6)	43·8
Kew		74·9	37	—	—	—	—	—	46·1
Rocca di Papa		87·8	37	—	—	i 23 59?	+ 9	—	—
Helwan		106·0	31	70 5	?L	—	—	(70·1)	—

Additional records: Lawrence gives iP? = +3m.19s. Ann Arbor SN = +13m.23s. (?L), L = +15·5m. Ithaca LE = +16·5m. Ottawa Ls from +22·1m. to +46·1m.

May 6d. 8h. 3m. 47s. Epicentre $41^{\circ}7'N$. $8^{\circ}5'E$.

A = +·738, B = +·110, C = +·665.

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Rocca di Papa		3·1	2 5	?L	—	—	(2·1)	4·0
Moncalieri		3·3	0 52	0	1 28	- 3	—	1·8
Milan		3·8	1 1	+ 2	1 52	+ 8	—	2·3
Monte Cassino		4·0	2 25	?L	—	—	(2·4)	—
Zurich	E.	5·6	e 2 2	-35	i 2 42	+ 8	—	3·0
	N.	5·6	e 2 3	+36	i 2 45	+11	—	—
Zagreb		6·8	e 2 17	+33	i 3 3	- 2	i 3·3	3·6
Batavia		100·3	—	—	—	—	e 45·2	—

Additional records: Rocca di Papa MN = +3·5m. Moncalieri MN = +2·1m. Zurich ePV = +2m.5s. Zagreb P = +2m.26s., SNE = +3m.14s.

May 6d. Records also at 0h. (San Fernando and Monte Cassino), 1h. (Monte Cassino and Rocca di Papa), 6h. (Stonyhurst), 7h. (Zurich and Zagreb), 13h. (La Paz), 14h. (Mizusawa and La Quiaca), 15h. (Ann Arbor), 20h. (Tortosa), 23h. (San Fernando).

May 7d. 6h. 28m. 46s. Epicentre $36^{\circ}0'N$. $139^{\circ}0'E$. (as on 1916 Aug. 8d. 4h.).

A = -·611, B = +·531, C = +·588.

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tokyo		0·7	0 12	+ 1	0 23	+ 3	—	0·6
Osaka		3·2	—	—	1 28	0	2·4	3·2
Kobe		3·4	—	—	1 31	- 3	2·6	2·7
Mizusawa	N.	3·5	0 56	+ 1	1 40	+ 3	—	—
	E.	3·5	0 53	- 2	1 34	- 3	—	—

May 7d. Records also at 0h. (Colombo), 4h. (Athens), 5h. (St. Louis), 7h. (Rio Tinto), 12h. (La Paz), 13h. (Mizusawa), 14h. (Edinburgh), 15h. (Helwan and La Paz), 18h. (Taihoku), 19h. (La Paz), 22h. (San Fernando).

May 8d. Records at 1h. (Rocca di Papa and Monte Cassino (2)), 2h. (Colombo), 4h. (Zagreb), 6h. (Rio Tinto), 7h. (Mizusawa), 13h. (Zi-ka-wei), 16h. (Batavia), 17h. (Monte Cassino), 21h. (Colombo), 22h. (Taihoku).

May 9d. Records at 3h. (San Fernando), 9h. (Washington and Ottawa), 11h. (La Paz), 16h. (Tortosa and Barcelona), 19h. (Stonyhurst).

May 10d. Records at 6h. (Rio Tinto), 13h. (De Bilt and Cipolletti), 14h. (La Quiaca), 15h. (De Bilt and Edinburgh), 16h. (Eskdalemuir), 17h. (Manila), 18h. (Kew), 19h. (La Paz).

May 11d. 21h. 23m. 4s. Epicentre $27^{\circ}8'S$, $113^{\circ}4'W$.

A = -·351, B = -·812, C = -·466; D = -·918, E = +·397;
G = +·185, H = +·428, K = -·885.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	43·1	84	8 19	0	i 14 51	+ 2	18·1	19·9
Berkeley	66·1	354	—	—	—	—	e 28·9	—
Washington	74·8	30	e 10 56?	-52	e 20 56?	-28	e 40·9	—
Toronto	77·9	25	—	—	—	—	40·4	—
Sydney	79·0	239	33 26?	?	—	—	38·4	40·2
Riverview	79·1	239	e 15 20?	?PR ₁	e 22 14	+ 1	e 32·7	40·4
Harvard	80·2	30	—	—	18 6	?PR ₁	e 38·2	—
Ottawa	80·8	26	e 12 24	0	e 22 33	0	e 39·9	—
Northfield	81·0	29	—	—	—	—	e 33·9	—
Melbourne	81·7	232	—	—	37 14	?	44·9	47·7
Capetown	103·2	141	55 14	?L	—	—	(55·2)	57·7
Coimbra	118·5	57	—	—	—	—	e 53·9	—
San Fernando	119·1	62	63 56	?L	—	—	(63·9)	—
Eskdalemuir	123·8	40	—	—	e 27 57	-81	58·1	—
Edinburgh	123·9	39	—	—	27 56	-82	—	73·3
Stonyhurst	124·2	43	e 28 8	?N	(28 8)	-72	—	42·4
	124·2	43	54 38	?	e 61 26	?L	(e 61·4)	70·9
Paris	127·2	48	—	—	e 53 56	?	73·9	—
De Bilt	E. 128·9	43	—	—	e 27 32	-141	e 60·9	63·6
	N. 128·9	43	—	—	e 38 38	?SR ₁	e 54·9	65·5
Moncalieri	130·8	51	—	—	—	—	74·2	—
Mauritius	131·4	171	64 32	?L	—	—	(64·5)	67·6
Helwan	149·1	79	47 56	?	—	—	—	—
Colombo	155·6	211	86 56	?L	—	—	(86·9)	—

Additional records: Riverview gives MN = +44·5m. Harvard T₀? = 21h.23m.27s. Ottawa L = +46·9m., +51·9m., T₀ = 21h.23m.16s. Melbourne SR₁ = +41m.32s. Eskdalemuir e = +30m.43s., S? = +37m.47s. De Bilt eE = +39m.2s. ?SR₁E. Epicentre $27^{\circ}7'S$, $113^{\circ}6'W$.

May 11d. Records also at 1h. (San Fernando), 2h. (Helwan), 4h. (Mizusawa), 9h. (Cipolletti), 11h. (Taihoku), 13h. (Rio Tinto), 20h. (Mizusawa, Harvard, Osaka, and Kew), 23h. (Stonyhurst and Rio Tinto).

May 12d. Records at 5h. (Taihoku and Zi-ka-wei), 11h. (Cipolletti), 13h. (De Bilt (2) and Athens).

May 13d. 13h. 58m. 3s. Epicentre $42^{\circ}8'N$, $12^{\circ}3'E$. (as on 1917 May 19d. 15h.).

A = +·717, B = +·156, C = +·679.

	Δ	P.	O-C.	S.	O-C.	M.
	°	m. s.	s.	m. s.	s.	m.
Rocca di Papa	1·1	10 18	+ 1	0 31	0	1·0
Monte Cassino	1·8	0 27	- 1	—	—	1·1
Pola	2·4	—	—	e 1 3	- 3	1·7
Pompeii	2·6	e 0 52	+11	—	—	1·8

Rocca di Papa gives MN = +0·8m.

May 13d. Records also at 1h. (De Bilt), 2h. (San Fernando), 3h. (Manila and Batavia), 5h. (Zagreb), 8h. (Helwan and Cipolletti), 9h. (Edinburgh), 11h. (Andalgala), 14h. (Manila), 16h. (Rocca di Papa), 23h. (Zi-ka-wei).

May 14d. Records at 0h. (Zagreb), 2h. (San Fernando and Zi-ka-wei), 4h. (Rocca di Papa), 5h. (Lick), 15h. (Helwan), 16h. (La Paz), 19h. (La Paz, Uccle, Edinburgh, Manila, and Riverview), 21h. (Helwan, Lick, and De Bilt (2)).

May 15d. Records at 1h. (San Fernando), 4h. (Manila), 7h. and 8h. (La Paz), 9h. (Kew), 16h. (Manila), 23h. (La Paz).

May 16d. 21h. 25m. 35s. Epicentre $18^{\circ} \cdot 0' \text{N. } 100^{\circ} \cdot 0' \text{W.}$ (as on 1917 Oct. 19d.).

$$\begin{aligned} \Delta &= -\cdot 165, B = -\cdot 937, C = +\cdot 309; & D &= -\cdot 985, E = +\cdot 174; \\ G &= -\cdot 054, H = -\cdot 304, K = -\cdot 951. \end{aligned}$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ann Arbor	N.	28.0	27	6 43	+35	10 25	-34	—	16.6
	E.	28.0	27	6 37	+29	9 37?	-82	16.2	16.4
Georgetown		28.8	39	e 12 48	?SR ₁	—	—	e 20.0	—
Washington		28.8	39	—	—	e 16 42	?	20.4	—
Toronto		31.0	30	—	—	—	—	e 21.6	24.6
Ottawa		34.0	31	e 7 59?	+54	e 12 37?	-3	e 15.1?	—
Harvard		34.6	39	19 59	?	21 7	?	23.9	24.4
Northfield		34.8	35	—	—	—	—	e 23.4	—
Victoria		35.8	333	16 14?	?SR ₁	—	—	18.2	19.7
La Paz		46.6	136	e 8 48	-4	e 15 48	+12	23.9	26.9
Edinburgh		79.0	35	23 25	?S	(23 25)	+73	—	52.9
Eskdalemuir		79.0	35	12 5?	-8	—	—	34.4	—
Bidston		79.9	37	36 37	?L	44 1	?	(36.6)	52.5
Kew		81.9	38	—	—	—	—	—	51.4
Paris		84.5	40	—	—	—	—	e 52.4	—
De Bilt	E.	84.8	37	12 45	-2	e 23 5	-12	e 48.4	57.2
	N.	84.8	37	—	—	e 23 29	+12	e 49.4	56.0
Helwan		113.0	45	75 25	?L	—	—	(75.4)	—

Additional records: Ann Arbor gives LN = +15.9m., ME = +18.5m. Berkeley ($\Delta = 27^{\circ} \cdot 8$) gives e at 21h.16m. \pm Georgetown SN? SE? = +17m.46s., LE = +20.8m. Ottawa Ls at +21.4m. and 24.4m., +28.4m. and +34.4m. T₀ = 21h.27m.44s.

May 16d. Records also at 1h. and 4h. (Manila), 6h. (Kobe and Osaka), 11h. (Taihoku and Zi-ka-wei), 16h. (Tacubaya), 20h. and 22h. (La Paz), 23h. (Lick).

May 17d. Records at 3h. (Zagreb), 4h. (Colombo), 5h. (La Paz), 15h. (La Paz), 18h. (Edinburgh (2)), 19h. (La Paz), 22h. (Stonyhurst), 23h. (Lick).

May 18d. Records at 0h. (San Fernando), 1h. (Stonyhurst), 2h. (Monte Cassino and Rocca di Papa), 3h. (Riverview), 9h. (Tacubaya), 15h. (Mizusawa), 16h. (Helwan), 18h. (Colombo).

May 19d. 0h. 25m. 22s. Epicentre $15^{\circ} \cdot 9' \text{N. } 83^{\circ} \cdot 7' \text{E.}$

$$\begin{aligned} A &= +\cdot 105, B = +\cdot 956, C = +\cdot 274; & D &= +\cdot 994, E = -\cdot 110; \\ C &= +\cdot 030, H = +\cdot 272, K = -\cdot 962. \end{aligned}$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Calcutta		7.9	30	2 2	+2	3 38	+4	—	—
Kodaikanal		8.4	233	—	—	—	—	4.0	7.4
Colombo		9.8	206	—	—	—	—	3.6	6.1
Bombay		10.9	290	3 1	+18	—	—	—	9.5
Simla		16.3	341	e 3 56	0	e 7 2	0	e 9.8	10.0
Batavia		31.8	154	e 12 38	?S	(e 12 38)	+33	—	—
Manila		35.9	88	e 6 52	-29	—	—	—	—
Helwan		49.8	297	17 44	?S	(17 44)	+88	—	37.2
De Bilt	E.	70.6	321	—	—	e 29 6	?	e 38.6	44.4
	N.	70.6	321	—	—	e 29 28	?	e 36.6	39.0
Kew		73.9	321	—	—	—	—	—	50.6
Edinburgh		75.2	326	46 18	?L	—	—	(46.3)	53.6
Eskdalemuir		75.3	325	—	—	—	—	34.6	—
Bidston		75.4	322	34 26	?L	38 50	?L	(34.4)	46.6

No additional records.

May 19d. Records also at 0h. (Apia), 8h. (Zagreb and La Paz), 10h. (Rio Tinto), 11h. (Eskdalemuir, Kew, and De Bilt), 13h. (Batavia), 17h. (Rocca di Papa, Manila, Zagreb, Mizusawa (2), and Osaka), 20h. (La Paz), 22h. (Taihoku).

1918. May 20d. 14h. 35m. 51s. Epicentre 7°4N. 35°2W.

A = +.810, B = -.572, C = +.129; D = -.576, E = -.817; ;
G = +.105, H = -.074, K = -.992.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Rio de Janeiro	B.O.	31'2	194	e 6 33	- 7	(11 57)	+ 3	11'9	17'2
Vieques	N. B.O.	31'3	295	e 6 40	- 1	e 11 47	- 9	e 13'8	14'1
	E. B.O.	31'3	295	e 6 39	- 2	e 11 39	-17	e 13'4	16'6
Accra	M.	34'9	90	13 49	? 1	21 49	?	(13'8)	—
San Fernando	—	39'3	37	7 39	-10	13 51	- 5	19'6	24'6
	—	39'3	37	6 21	-88	13 39	-17	19'2	26'2
La Paz	Bi.	40'4	233	i 7 57	- 1	i 14 5	- 8	20'8	21'8
Coimbra	—	40'4	31	7 52	- 8	i 14 5	- 9	16'8	18'4
La Quiaca	N. M.	42'0	224	7 27	-44	9 27	? PR ₁	—	—
	E. M.	42'0	224	7 57	-14	9 57	? PR ₁	—	—
Balboa Hts.	N. B.O.	43'9	276	7 57	-28	—	—	18'0?	18'2
	E. B.O.	43'9	276	—	—	—	—	18'2?	18'4
Algiers	B.M.	45'5	46	i 8 30	- 7	15 11	-10	20'1	22'1
Andalgala	N. M.	46'1	219	7 57	-44	11 45	? PR ₁	—	26'8
	E. M.	46'1	219	8 27	-14	11 27	? PR ₁	—	—
Tortosa	—	46'1	38	8 35	- 6	15 24	- 5	21'0	23'8
Harvard	N. B.O.	47'1	324	8 28	-20	15 17	-25	—	—
	E. B.O.	47'1	324	8 50	+ 2	15 31	-11	—	—
Chacarita	M.	47'4	208	7 57	-53	11 27	? PR ₁	25'0	—
Barcelona	—	47'5	38	8 46	- 5	i 15 39	- 9	19'0	25'3
Pilar	N. M.	47'7	214	8 27	-25	10 27	?	—	16'4
	E. M.	47'7	214	8 33	-19	13 57	-113	—	28'0
Fordham	N. W.	47'9	320	4 21	?	i 11 16	? PR ₁	15'0?	—
	E. W.	47'9	320	—	—	i 11 19	? PR ₁	15'0?	—
Cheltenham	N. B.O.	48'8	316	9 3	+ 4	16 4	0	e 22'8	24'0
	E. B.O.	48'8	316	—	—	16 4	0	e 23'0	26'2
Georgetown	N. —	49'0	318	i 9 2	+ 2	i 16 8	+ 2	22'7	23'8
	E. —	49'0	318	i 9 3	+ 3	i 16 8	+ 2	22'7	24'0
Washington	Mar.	49'0	318	9 0	0	16 4	- 2	22'7	—
Northfield	N. B.O.	49'1	325	e 8 59	- 2	16 9	+ 2	21'2	—
Ithaca	E. B.O.	50'5	322	9 2	- 8	i 16 23	- 2	21'6	—
	N. B.O.	50'5	322	—	—	i 16 24	- 1	21'1	—
Marseilles	Ma.	50'5	37	i 9 14	+ 4	16 26	+ 1	—	16'6
Ottawa	—	51'6	326	i 9 19	+ 2	i 16 41	+ 2	e 22'2	—
Shide	M.S.	51'6	27	9 17	0	16 41	+ 2	20'7?	25'6
	M.B.	51'6	27	9 1?	-16	16 18?	-21	—	—
Paris	—	52'2	31	i 9 22	+ 1	i 16 45	- 1	23'2	25'2
Kew	M.	52'6	27	7 9	?	—	—	—	24'2
West Bromwich	M.S.	52'7	25	9 25	+ 1	16 54	+ 2	—	—
Bidston	M.S.	52'8	24	9 27	+ 2	16 45	- 9	—	25'2
Moncalieri	S.	52'8	38	i 9 26	+ 1	i 16 48	- 6	22'9	31'7
Toronto	M.	52'9	321	e 9 21	- 4	17 15	+20	e 22'6	29'8
Besancon	—	53'0	34	9 30	+ 4	17 3	+ 7	24'2	—
Stonyhurst	M.	53'1	24	i 6 21	?	i 15 45	?	i 21'8	28'4
Milan	—	53'9	37	9 43	+11	—	—	—	18'0
Eskdalemuir	G.	54'2	22	9 34	0	17 5	- 6	—	—
Zurich	—	54'2	36	i 9 41	+ 7	i 17 21	+10	—	—
Uccle	—	54'3	30	i 9 38	+ 3	i 17 15	+ 2	24'0	24'4
Rocca di Papa	Ag.	54'4	42	i 9 39	+ 4	i 17 20	+ 6	e 25'8	34'6
Edinburgh	M.	54'7	21	9 39	+ 2	—	—	—	24'8
Ann Arbor	N. B.	55'0	318	9 27	-12	17 21	0	25'8	29'8
	E. W.	55'0	318	9 45	+ 6	17 33	+12	26'0	30'1
	N. B.	55'0	318	9 51	+12	—	—	26'0	27'6
	E. W.	55'0	318	—	—	—	—	25'8	27'2
Monte Cassino	Ag.	55'1	43	9 43	+ 3	—	—	—	10'1
Pompeii	N. O.A.	55'3	45	i 9 55	+14	i 17 45	+20	e 31'3	35'3
	E. O.A.	55'3	45	i 9 56	+15	i 17 38	+13	—	36'4
De Bilt	N. —	55'5	30	i 9 49	+ 6	i 17 33	+ 5	24'2	27'4
	E. —	55'5	30	—	—	i 17 34	+ 6	—	28'4
Cipolletti	M.	55'5	211	7 57	-106	13 29	? PR ₁	—	16'6
Dyce	N. Ma.	56'1	21	i 9 53	+ 6	17 41	+ 6	23'0	29'3
	E. Ma.	56'1	21	9 53	+ 6	17 39	+ 4	23'0	29'6

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O—C.	S.	O—C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Pola	W.	56.5	39	i 9 53	+ 4	(e 17 16)	-24	e 17.3	17.9
St. Louis	W.	58.3	311	i 10 15	+14	18 15	+12	27.4	33.0
Zagreb	W.	58.3	40	e 10 7	+ 6	e 18 5	+ 2	32.2	34.1
Athens	M.	61.2	51	10 26	+ 6	18 46	+ 8	e 24.2	30.6
Tacubaya	—	63.1	288	10 46	+13	—	—	—	—
Lemberg	B.O.	64.8	38	i 10 52?	+ 8	e 14 57	? PR ₁	e 35.2	39.0
Cape Town	M.	65.5	132	11 9	+21	20 9	+38	20.4	20.6
Helwan	M.	66.0	61	11 9	+18	13 27	? PR ₁	—	45.4
Tucson	E. B.O.	73.9	302	e 10 9	-92	e 21 9	- 4	e 35.2	43.2
Berkeley	—	83.2	308	e 12 40	+ 3	e 23 4	+ 5	—	43.6
Victoria	M.	83.2	319	13 14	+37	23 18	+19	40.4	49.4
	Z.	83.2	319	13 3	+26	24 9	+70	40.6	46.6
Sitka	B.O.	89.2	328	e 24 10	? S	(e 24 10)	+ 5	e 36.9	43.2
Mauritius	N. M.	95.4	110	24 9	? S	(24 9)	-61	38.0	41.0
	E. M.	95.4	110	24 9	? S*	(24 9)	-61	39.8	51.4
Bombay	O.E.	104.4	68	18 27	? PR ₁	—	—	—	61.1
Simla	O.E.	104.9	56	—	—	—	—	—	59.0
Kodaikanal	M.	110.7	76	28 39	? S	(28 39)	+65	57.2	67.6
Colombo	M.	113.6	79	—	—	21 45?	? PR ₁	36.2	73.4
Honolulu	M.	116.9	298	20 33	? PR ₁	26 9	?	30.2	36.8
Zi-ka-wei	—	135.4	29	e 21 57	? PR ₁	—	—	e 55.8	62.4
Apia	W.	136.9	258	e 23 54	? PR ₁	40 39	? SR ₁	75.2	82.2
Osaka	O.	137.0	12	22 42	? PR ₁	40 35	? SR ₁	61.1	79.0
Taihoku	O.	140.4	34	—	—	e 35 46	?	—	—
Batavia	W.	142.4	90	e 19 55	[+11]	—	—	e 72.2	88.2
Perth	M.	143.6	136	21 51	[+?	—	—	—	—
Manila	W.	147.7	46	e 20 6	[+14]	—	—	76.3	77.0
Melbourne	M.	149.6	181	—	—	42 51	? SR ₁	52.4	52.6
	M.	149.6	181	—	—	78 33	? L	82.6	86.6
Riverview	—	152.9	193	e 17 39	?	e 32 21	?	e 63.2	66.2
Sydney	M.	152.9	193	39 39	?	—	—	43.6	45.8

Additional records : Rio de Janeiro S = +10m.9s., M = +16.6m., M = +18.6m. San Fernando LE = +20.2m. La Paz PR₁ = +9m.30s., SR₁ = +17m.15s., M = +24.9m., T₀ = 14h.36m.3s. Coimbra PR₁E = +9m.20s., PR₁N = +9m.22s., S? = +13m.56s., LN = +16.9m., MN = +17.8m., T₀ = 14h.36m.4s. Barcelona PR₁ = +10m.31s., MN = +28.1m., T₀ = 14h.35m.57s. Pilar PE = +10m.39s. (?PR₁). Fordham iPR₁E = +6m.9s. Records given as 15h.—Harvard T₀ = 14h.35m.43s. Washington PR₁ = +13m.40s., L = +30.5m., +37.8m., and +54.8m., T₀ = 14h.35m.57s. Northfield L = +24.2m. Ottawa L = +29.2m., +32.2m., T₀ = 14h.35m.55s. Moncalieri MN = +30.2m., T₀ = 14h.36m.3s. Toronto iP = +16m.33s., L = +25.2m., T₀ = 14h.35m.24s. Eskdalemuir PR₁ = +11m.54s., T₀ = 14h.36m.0s. Uccle PR₁ = +12m.33s., M₂ = +25.9m., T₀ = 14h.35m.58s. Rocca di Papa M = +63.0m. Edinburgh M = +25.8m. De Bilt PR₁ = 11m.47s., m = +17m.43s., T₀ = 14h.36m.1s. Epicentre 8° 9'N., 37° 3'W. Pola MN = +29.8m. Zagreb i = +10m.17s. and +10m.29s., eS = +17m.26s., iS = +18m.14s., M = +37.2m. Athens MN = +42.6m., T₀ = 14h.35m.59s. Berkeley MN = +43.9m., T₀ = 14h.36m.5s. Mauritius, recrudescence PN = 16h.47m.54s., MN = 16h.50m.42s., PE = 16h.47m.42s., ME = 16h.50m.48s. Simla gives e = 14h.34m.48s. Possibly a mistake. Zi-ka-wei MN = +70.8m. Apia S? = +57m.9s. and +66m.9s. Osaka MN = +75.7m. Batavia M = +28.2m. ML₂ = +116.2m. Manila MN = +81.9m. Melbourne SR₁ = +47m.9s., SR₂ = +48m.27s., S = +78m.33s., SR₁ = +80m.27s. Riverview e = +43m.15s., +43m.37s., +44m.32s., and +44m.57s., MN₁ = +67.1m. The residuals [+13] and [+14] for Batavia and Manila suggest a "high focus," and this would suit some other features of the records, but not all. The La Paz records could not be reconciled with those of Europe on this supposition.

1918. May 20d. 17h. 55m. 5s. Epicentre 29° 6S. 71° 5W.

A = +.276, B = -.823, C = -.494; D = -.948, E = -.317;
G = -.157, H = +.468, K = -.870.

The few antiecentric observations suggest a deep focus, which would account for the negative residuals in the azimuth of La Paz, but the evidence is scarcely sufficient to warrant a definitive solution.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Andalgala	M.	5.0	67	2 19	? S	(2 19)	+ 2	—	6.7
Pilar	N. E.	M. 6.9	110	1 43	- 2	—	—	—	5.2
	E.	M. 6.9	110	1 49	+ 4	—	—	—	5.2
La Quiaca	N. E.	M. 9.1	36	3 7	+49	4 55	+49	—	—
	E.	M. 9.1	36	3 13	+55	5 1	+55	—	—
Cipolletti	M.	9.8	164	0 43	-104	—	—	—	—
Chacareta	M.	12.1	118	2 43	-17	—	—	—	6.9
La Paz	Bi.	13.4	14	3 20	- 2	5 56	+ 3	—	—
Rio de Janeiro	N. B.O.	26.2	82	15 43	- 7	10 13	-13	12.9	15.0
	E. B.O.	26.2	82	15 43	- 7	10 7	-19	12.9	16.7
Balboa Hts.	N. B.O.	39.3	347	7 5	-44	—	—	17.0?	17.1
	E. B.O.	39.3	347	6 59	-50	—	—	17.0?	—
Vieques	N. B.O.	48.2	8	10 50	+115	—	—	18.9	—
	E. B.O.	48.2	8	—	—	—	—	18.4	19.6
Cheltenham	N. B.O.	68.5	356	10 58	-10	—	—	—	20.3
	E. B.O.	68.5	356	11 16	+ 8	—	—	—	20.6
Georgetown	N. E.	68.7	355	e 10 59	-10	i 19 57	-13	e 31.2	—
	N.	68.7	355	i 10 57	-12	e 19 57	-13	e 31.2	—
Washington	Mar.	68.7	355	11 13	+ 4	19 57	-13	e 35.5	—
St. Louis	N. W.	70.4	345	i 11 13	- 6	(20 19)	-12	20.3	20.9
Harvard	N. W.	71.9	0	11 23	- 6	20 41	- 8	e 34.6	—
Ithaca	N. B.O.	72.1	356	11 17	-14	20 33	-18	—	—
	E. B.O.	72.1	356	—	—	i 20 31	-20	e 32.2	—
Ann Arbor	N. B.	72.8	351	11 43	+ 8	20 55	- 5	—	—
	N. W.	72.8	351	11 19	-16	—	—	32.8	33.9
	E. W.	72.8	351	11 25	-10	—	—	33.6	38.7
Toronto	M.	73.6	354	—	—	20 43	-26	—	21.4
Northfield	N. B.O.	73.8	359	e 11 32	- 9	20 55	-17	—	—
Cape Town	M.	74.0	121	11 43	- 1	20 55	-19	40.9	42.9
Ottawa	—	75.1	357	11 37	-13	21 3	-24	e 34.9	—
Lick	W.	81.5	322	e 12 19	- 9	e 22 27	-14	—	—
Berkeley	N. E.	82.4	322	i 12 18	-14	e 22 31	-19	—	53.6
	N.	82.4	322	i 12 19	-13	i 22 32	-18	—	—
San Fernando	—	90.1	47	13 25	+ 8	23 25	-50	51.9	57.4
Victoria	M. W.	90.8	328	13 17	- 3	23 36	-46	39.8	52.3
	Z. W.	90.8	328	12 25	-55	25 7	+45	—	46.4
Coimbra	—	91.1	43	12 55	-27	23 25	-60	42.9	49.4
Apia	W.	91.8	253	e 12 55	-31	e 16 55	? PR ₁	19.9	27.9
Granada	C.	92.2	48	13 48	+20	24 54	+17	—	—
Algiers	B. M.	96.4	52	e 13 41	-10	23 55	-85	42.9	48.9
Tortosa	—	96.9	46	13 44	-10	23 59	-86	40.6	58.5
Barcelona	—	98.3	47	e 13 49	-13	24 3	-96	45.7	53.9
Paris	—	102.4	40	—	—	i 24 24	-115	46.9	55.9
Stonyhurst	M.	102.5	35	—	—	—	—	—	60.5
Moncalieri	S.	103.6	46	13 59	-29	24 21	-128	32.6	63.8
Uccle	—	104.4	39	e 14 1	-31	e 24 25	-132	45.9	61.9
Zurich	—	105.2	43	e 14 24	-11	24 39?	-125	—	—
Rocca di Papa	Ag.	105.3	50	e 14 25	-11	e 27 34?	+49	e 51.6	—
De Bilt	N. E.	105.4	39	(e 18 53)	? PR ₁	e 24 41	-125	50.9	52.6
	N.	105.4	39	—	—	e 24 42	-124	55.9	56.6
Pompeii	—	106.1	52	i 19 42	? PR ₁	i 28 2	+69	e 54.0	62.0
Pola	W.	107.4	47	e 18 50	? PR ₁	e 24 48	? PR ₁	e 52.0	64.9
Zagreb	W.	109.2	48	e 14 39	-15	e 24 56	?	57.9	67.9
Athens	—	111.7	58	—	—	e 41 13	?	e 57.6	63.2
Kolombo	M.	144.8	124	(19 31)	[-17]	—	—	19.5	47.2
Kodakanal	M.	145.1	115	19 19	[-29]	—	—	76.5	87.2
Bombay	O. E.	145.9	98	19 36	[-14]	—	—	—	74.6
Simla	O. E.	153.0	77	—	—	e 39 7	?	—	—
Calcutta	O. E.	160.6	106	18 49	[-80]	—	—	—	—

Notes continued on next page.

NOTES TO MAY 20d. 17h. 55m. 5s.

Additional records: Pilar gives MN = +10.7m. St. Louis iPE = +9m.55s., SN = +15m.37s. (?PR₁). Ithaca iE = iN = +21m.7s. Ann Arbor T₀ = 17h.55m.24s. Ottawa PR₁ = +14m.41s., PR₂ = +16m.25s., SR₁ = +26m.10s. L = +39.9m., +44.9m., T₀ = 17h.55m.15s. Lick T₀ = 17h.55m.14s. Berkeley T₀ = 17h.55m.9s. San Fernando MN = +57.9m. Coimbra iN = +23m.54s., MN = +48.4m. Granada gives epicentre 27° 0S., 72° 0W. Barcelona LN = +38.4m., M = +58.9m. Paris I₂ = +24m.53s. Moncalieri MN = +60.1m. Pola MN = +63.4m. Zagreb iNW = +18m.57s., iNE = +19m.12s., iNE = +25m.29s., MNW = +62.9m.

May 20d. 18h. 3m. 39s. Epicentre 0° 5S. 152° 0E.

A = - .883, B = + .470, C = - .009; D = + .470, E = + .883;
G = + .008, H = - .004, K = - 1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Sydney	33.3	181	7 51	+52	12 51	+22	16.0	19.0
Riverview	33.3	181	e 6 24	-35	e 11 27	-62	e 14.2	17.0
Manila	34.1	298	e 6 2	-64	11 59	-43	17.0	20.8
Adelaide	36.6	198	11 39	?	—	—	—	—
Melbourne	37.9	190	—	—	15 21	?SR ₁	19.8	20.4
Osaka	38.4	339	7 31	-10	(13 33)	-11	13.6	16.7
Taihoku	39.0	314	7 42	-4	—	—	—	—
Mizusawa	E. 40.9	349	7 58	-4	14 21	+1	—	—
	N. 40.9	349	7 59	-3	14 15	-5	—	—
Zi-ka-wei	43.0	321	7 43	-35	12 49	?	e 17.6	22.2
Batavia	45.4	262	(8 31)	-5	8 31	?P	—	9.6
Perth	46.4	225	(9 15)	-32	13 52	-101	21.2	25.0
Honolulu	53.4	61	e 9 21	-8	(15 33)	-88	15.6	19.6
Colombo	72.4	277	—	—	—	—	58.8	84.2
Mauritius	N. 93.6	250	11 39	?	—	—	43.0	48.2
	E. 93.6	250	13 33	-3	—	—	42.2	47.4
Lemberg	113.8	327	e 11 21	?	i 16 44	?P	e 52.6	90.2
Toronto	117.3	40	—	—	—	—	e 62.8	77.0
Ottawa	118.6	37	—	—	—	—	e 58.4	—
Athens	119.5	316	—	—	e 32 39	?SR ₁	e 49.0	58.8
Dyce	N. 119.6	345	i 16 37	+57	28 51	+5	35.8	40.2
	E. 119.6	345	i 16 39	+59	—	—	—	53.2
Ithaca	N. 119.7	39	—	—	—	—	60.8	—
	E. 119.7	39	—	—	—	—	62.0	—
Edinburgh	121.1	343	—	—	—	—	—	55.7
De Bilt	121.4	337	—	—	—	—	e 59.8	60.3
Fordham	E. 122.2	40	e 58 10	?L	i 67 13	?	(e 58.2)	—
	N. 122.2	40	e 58 4	?L	i 67 19	?	(e 58.1)	—
Bidston	123.2	343	15 45	-13	24 9	?	—	31.4
West Bromwich	123.6	343	15 41?	-18	25 51?	?	—	—
Kew	123.9	342	14 21	-100	—	—	—	51.4
Rocca di Papa	124.8	325	—	—	—	—	62.7	—
Shide	124.9	341	15 41	-22	28 58?	-27	—	51.0
Rio Tinto	137.9	336	29 21	?S	(29 21)	-90	—	42.4

Additional records: Manila gives MN = +18.1m. Adelaide PR₁ = +16m.51s. Melbourne SR₁ = +17m.15s., SR₂ = +17m.57s. Zi-ka-wei MN = +30.2m. Batavia P = +7m.11s. Perth P = +7m.34s., the real P is recorded as PR₁. PS = +13m.30s., SR₁ = +17m.37s., SR₂ = +19m.7s. Lemberg records M an hour too soon. Toronto eL = +67.6m. Ottawa L = +66.4m. and +71.4m. Dyce PR₁N = +20m.35s., PR₁E = +20m.37s., ME = +54.2m. Rocca di Papa L = +57.2m.

May 20d. Records also at 14h. (Toronto), 15h. (Melbourne and Sydney), 16h. (Lawrence), 20h. (Riverview), 21h. (Harvard), 23h. (La Paz).

May 21d. 11h. 15m. 10s. Epicentre 11° 7N. 176° 0E.

A = - .977, B = + .068, C = + .203; D = + .070, E = + .998;
G = - .202, H = + .014, K = - .979.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	51.3	206	e 9 14	-1	(e 22 14)?	?SR ₁	e 26.2	29.0
Sydney	51.3	206	20 8	?SR ₁	—	—	27.3	29.1
Manila	53.6	280	—	—	e 17 5	+1	—	—
Melbourne	57.4	209	—	—	—	—	29.0	30.5
Perth, W.A.	72.2	230	—	—	—	—	31.1	—
Kodaikanal	96.2	282	68 56	?	—	—	—	—
Edinburgh	112.4	0	69 50	?L	—	—	(69.8)	—
De Bilt	115.7	353	—	—	e 40 24	?SR ₁	e 69.8	75.8

Additional records: Riverview gives MN = +30.5m., and eSR₁ = +22m.14s., as in the table.

May 21d. Records also at 0h. (Kodaikanal (2)), 1h. (Kodaikanal), 2h. (San Fernando), 5h. (Calcutta), 6h. (La Paz), 8h. (Helwan and De Bilt), 9h. (Colombo), 13h. (Moncalieri and Kodaikanal (2)), 14h. (Perth and Kodaikanal (2)), 15h. (Rocca di Papa and Kodaikanal), 17h. (Kodaikanal), 19h. (Manila) 20h. (Kodaikanal), 21h. (La Paz), 22h. (Granada and Edinburgh), 23h. (Moncalieri).

1918. May 22d. 6h. 31m. 20s. Epicentre 17°0S. 177°5W.

A = -955, B = -042, C = -292; D = -044, E = +999;

G = +292, H = +013, K = -956.

A focal depth 0.050 has been assumed for this epicentre, as suggested by the observations near the anticentre.

Station and Component.	Machine.	Corr. for Focus	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
					M. S.	S.	M. S.	S.	M.	M.
Apia	W.	-0.1	6.3	61	i 1 38	0	—	—	2.8	3.2
Riverview		-3.4	32.7	232	i 6 7	-14	i 10 53	-29	e 12.7	14.3
Melbourne	M.	-3.9	38.9	230	6 52	-21	—	—	16.3	16.4
Perth	M.	-5.5	61.6	242	9 53	-6	—	—	—	—
Mizusawa	N. O.	-5.8	68.1	328	10 32	+5	12 47	? PR ₁	—	—
	E. O.	-5.8	68.1	328	10 27	0	12 46	? PR ₁	—	—
Osaka	O.	-5.8	68.3	320	10 27	-2	19 0	+5	26.5	30.0
Manila	W.	-5.9	68.4	295	e 10 37	-8	—	—	15.8	16.3
Taihoku	O.	-6.0	72.7	306	11 1	+5	(19 54)	+8	19.9	20.1
Batavia	W.	-6.1	74.5	269	i 11 8	+1	—	—	—	21.7
Berkeley		-6.1	75.4	41	e 12 45	+92	—	—	—	—
Victoria		-6.2	81.2	33	—	—	—	—	21.4	24.4
La Paz	Bi.	-6.8	102.7	112	15 45	+117	23 32	-103	36.7	45.1
Ann Arbor	B.	-6.9	104.0	50	—	—	25 16	-11	33.7	33.7
Colombo	M.	-6.9	104.1	271	17 40	? PR ₁	—	—	—	23.2
Kodaikanal	M.	-7.0	107.3	274	23 52	?	—	—	—	—
Toronto	M.	-7.0	107.3	49	—	—	(24 4)	-115	24.1	—
Georgetown	E. N.	-7.0	108.5	53	—	—	e 23 48	-142	33.1	—
		-7.0	108.5	53	—	—	e 25 27	-43	33.2	—
Washington	Mar.	-7.0	108.5	53	—	—	—	—	e 32.7	—
Ithaca	B.O.	-7.0	109.3	48	—	—	e 23 32	-166	e 33.0	—
Ottawa		-7.1	110.1	46	e 18 42	?	i 25 40	-44	e 32.5	—
Harvard	M.	-7.2	113.3	50	e 18 48?	?	25 22?	-91	e 33.7?	—
Mauritius	M.	-7.2	114.2	237	25 46	?	(27 16)	+15	—	29.9
Edinburgh	M.	—	140.9	6	25 40	? PR ₁	—	—	—	42.9
Eskdalemuir	G.	—	141.4	6	e 18 49	-53	e 25 32	? PR ₁	—	40.3
Lemberg	B.O.	—	142.8	358	e 18 46	-59	—	—	—	27.6
De Bilt		—	144.8	337	i 19 3	-45	—	—	—	—
Shide	M.S.	—	146.1	4	19 6	-44	—	—	40.4	—
Uccle		—	146.2	358	i 19 3	-47	—	—	—	—
Paris		—	148.2	1	i 19 10	-43	—	—	40.7	—
Zagreb	W.	—	149.1	342	i 19 15	-39	—	—	50.7	—
Zurich		—	149.2	351	e 19 8	-46	—	—	—	—
Moncalieri	S.	—	151.6	352	19 9	-49	28 23?	?	36.1	—
Rocca di Papa	Ag.	—	153.7	343	19 15	-46	23 18?	? PR ₁	e 42.4	—
Monte Cassino	Ag.	—	153.7	341	19 14	-47	—	—	—	—
Pompei	O.A.	—	154.1	339	19 35	-26	—	—	—	—
Combra		—	154.9	21	e 20 16	+14	31 55	—	42.4	—
Barcelona		—	155.5	0	18 30	-92	—	—	—	43.5
Tortosa		—	156.1	5	19 12	-51	—	—	42.7	42.7
Rio Tinto	M.	—	157.7	20	30 10	? S	(30 10)	?	—	45.2

Additional records: Riverview gives ePR₁ = +7m.22s. and +7m.39s., MN = +14.2. Osaka MN = +31.5m. Georgetown iE = +24m.40s. Ithaca eN = +25.4m., eE = +27.6m. Ottawa eL = +40.7m., L = +68.7m., T₀ = 6h.41m.15s. Harvard L = +37.8m., T₀ = 6h.41m.0s. Mauritius MN = +30.3m. The record, taken as S, is given as PE. Zagreb ePNW = +19m.7s.

May 22d. Records also at 0h. (Rocca di Papa), 2h. (Taihoku), 3h. (Mizusawa and Kodaikanal), 6h. (Riverview and San Fernando), 7h. (Kodaikanal (2)), 10h. (La Paz), 16h. (Kodaikanal and Uccle), 17h. (La Paz), 23h. (Kodaikanal, Rocca di Papa, and Monte Cassino).

1918. May 23d. 11h. 57m. 32s. Epicentre 27°-0N. 109°-5W.

A = -297, B = -840, C = +454; D = -943, E = +334;
G = -152, H = -428, K = -891.

Station and Component.		Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
					M. S.	S.	M. S.	S.	M.	M.
Tucson	N.	B.O.	5.4	348	e 1 20	- 3	—	—	e 2.7	—
	E.	B.O.	5.4	348	e 1 40	+17	—	—	e 2.8	—
Tacubaya			12.1	127	3 6	+ 6	—	—	—	7.9
Denver		W.	13.2	16	3 28	+12	7 28?	? L	(7.5?)	8.5
Lick		W.	14.4	317	e 3 17	-15	e 6 2	-16	e 7.1	8.0
Berkeley		—	15.3	318	i 3 22	-21	e 6 20	-19	e 7.3	8.2
Lawrence		W.	16.9	41	4 8	+ 4	7 21	+ 5	9.5	—
St. Louis		W.	19.8	49	i 4 46	+ 7	8 34	+15	9.6	12.5
Victoria		M.	23.9	337	4 59	-28	9 37	- 5	12.6	16.1
	Z.	—	23.9	337	5 18	- 9	9 45	+ 3	13.4	15.0
Ann Arbor	E.	B.	26.0	47	6 16	+28	11 4	+42	14.3	16.9
	N.	B.	26.0	47	6 22	+34	11 10	+48	14.0	16.0
	E.	W.	26.0	47	6 16	+28	10 40	+18	14.4	15.7
	N.	W.	26.0	47	6 22	+34	11 10	+48	14.2	16.9
Toronto		M.	29.4	48	—	—	12 4	+40	17.0	19.5
Georgetown	N.	—	29.5	58	e 6 25	+ 2	e 12 8	+42	e 15.8	16.7
Washington		Mar.	29.5	58	6 13	-10	12 33	+67	15.9	17.0
Cheltenham		B.O.	29.6	58	e 11 42	? S	(11 42)	+15	e 15.6	19.6
Ithaca		B.O.	30.9	49	e 6 24	-13	e 11 36	-14	e 14.2	19.9
Ottawa		—	32.5	46	e 6 34	-19	e 12 1	-15	e 15.5	—
Northfield		B.O.	34.1	50	e 7 18	+12	—	—	e 15.0	—
Harvard		B.O.	34.7	54	e 7 16	+ 5	13 9	+18	e 17.6	20.5
Sitka		B.O.	35.2	336	7 31	+16	12 34	-24	e 17.5	22.7
Honolulu		M.	44.4	274	e 7 28	-61	—	—	17.5	19.7
La Paz		Bi.	59.2	132	10 15	+ 9	19 25	+72	27.0	28.2
Apia		W.	72.9	244	e 20 28?	? S	(e 20 28?)	-33	33.5	36.5
Dyce	N.	Ma.	76.2	32	12 0	+ 4	21 46	+ 7	32.4	44.8
	E.	Ma.	76.2	32	11 58	+ 2	—	—	40.5	50.5
Cipolletti		M.	76.4	148	39 16	? L	—	—	(39.3)	—
Edinburgh		M.	76.4	34	21 28	? S	(21 28)	-16	—	51.0
Eskdalemuir		G.	76.6	34	11 57	- 2	21 51	+ 7	35.5	38.0
Bidston		M.S.	77.6	37	11 58	- 7	21 58	+ 2	—	45.9
Stonyhurst		M.	77.8	35	i 25 34	?	i 31 58	?	37.3?	44.2
Shide		—	79.9	38	12 21?	+ 3	22 27?	+ 5	32.8	50.6
Kew		M.	80.1	37	36 28	? L	—	—	(36.5)	49.5
Coimbra		—	80.7	49	12 28	+ 5	22 25	- 6	38.4	42.0
De Bilt		—	82.5	35	12 36	+ 3	22 56	+ 4	e 35.5	48.4
Uccle		—	82.8	36	e 12 28	- 7	e 22 28	-27	e 36.5	44.9
Paris		—	83.0	38	e 12 36	0	e 22 58	+ 1	34.5	41.5
San Fernando		—	84.0	52	12 58	+16	21 43	-85	41.5	48.0
Tortosa		—	85.3	46	13 8	+18	23 34	+12	38.8	44.2
Besançon		—	85.8	39	—	—	—	—	43.5	—
Barcelona		—	86.9	44	13 42	+44	23 37	- 3	41.5	48.6
Zurich		—	87.1	38	e 12 58	- 2	—	—	—	—
Marseilles		—	87.8	43	—	—	—	—	e 41.4	—
Moncalieri		S.	88.1	39	23 36	? S	(23 36)	-17	38.9	49.0
Milan		—	88.8	39	23 29	? S	(23 29)	-30	44.5	—
Algiers		B.M.	90.1	48	e 13 38	+21	24 3	-12	37.5	41.5
Pola		W.	91.5	37	—	—	e 24 46	+17	e 43.8	52.4
Zagreb		W.	92.0	35	e 13 10	-17	e 23 53	-42	46.5	48.5
Lemberg		B.O.	92.8	29	e 38 16	?	—	—	e 45.6	59.6
Osaka		O.	93.0	312	13 46	+14	27 12	?	40.3	50.5
Rocca di Papa		Ag.	93.0	40	e 20 50	? PR ₁	—	—	i 44.2	61.1
Zi-ka-wei		—	104.2	317	—	—	23 48	?	—	69.4
Taihoku		O.	108.5	312	—	—	—	—	e 44.7	—
Sydney		—	111.9	242	—	—	—	—	51.5	57.6
Riverview		—	112.0	242	e 15 52	+45	e 29 4	+78	e 51.0	52.7
Helwan		M.	112.2	36	15 28	+20	—	—	—	—
Manila		W.	115.8	304	—	—	e 29 37	+81	54.0	57.7
Melbourne		M.	117.9	239	29 40	? S	(29 40)	+67	73.1	74.6
Simla		O.E.	121.5	353	—	—	—	—	e 59.2	71.2
Bombay		O.E.	134.0	357	64 54	? L	—	—	(64.9)	—
Cape Town		M.	135.1	112	37 16	?	—	—	—	—
Kodaikanal		M.	142.2	349	20 28	[+45]	—	—	87.1	92.8
Colombo		M.	145.0	344	62 28	?	—	—	84.5	90.5
Mauritius	N.	M.	166.5	62	39 46	?	—	—	—	96.1
	E.	M.	166.5	62	38 58	?	—	—	—	95.6

For Notes see next page.

NOTES TO MAY 23d. 11h. 57m. 32s.

Additional records: Denver gives $LEN = +11.5m$. All records from Denver are 1hr. wrong. Lick $MN = +8.9m$, $MV = +9.0m$, $T_0 = 11h.57m.26s$. Berkeley $eSN = +6m.14s$, $MN = +8.0m$, $T_0 = 11h.57m.21s$. Lawrence $SE? = +7m.27s$, $T_0 = 11h.57m.40s$. St. Louis $SE = +8m.40s$, $T_0 = 11h.57m.37s$. Toronto $i = +16m.4s$. Cheltenham $MN = +17.9m$. Ithaca $eN = +11m.33s$, $MN = +18.6m$. Ottawa $L = +34.5m$ and $+47.5m$, $T_0 = 11h.57m.13s$. Harvard $L = +19.0m$, $T_0 = 11h.57m.22s$. La Paz $PR_1 = +13m.35s$, $T_0 = 11h.56m.37s$. Apia $eS? = 29m.58s$ and $+30m.58s$. Eskdalemuir $SR? = +26m.42s$, $T_0 = 11h.57m.33s$. Coimbra $MN = +40.8m$. De Bilt $eSR_1 = +28m.10s$, $M = +42.6m$, $T_0 = 11h.57m.46s$. Barcelona $PS = +25m.24s$, $MN = +53.6m$. Moncalieri $S = +32m.10s$, $MN = +45.0m$. Pola $MN = +50.1m$. Zagreb $e = +34m.28s$. Osaka $MN = +45.2m$. Zi-ka-wei $MN = +69.7m$. These records have been corrected by $+1h$. Riverview $PS = +30m.52s$, $SR_1 = +35m.24s$, $MN = +59.0m$. Helwan records a shock earlier than T_0 , which has been corrected by $+1h$. Manila $S = +39m.9s$. ($= SR_1?$). Melbourne $PR_1 = +36m.40s$, $S = +44m.16s$, $SR_2 = +56m.52s$. Kodaikanal the P has been corrected by $-1h$.

May 23d. Records also at 1h. (Kodaikanal), 2h. (Colombo and Kodaikanal), 6h. (Helwan), 9h. (Sydney, Apia, and Riverview), 10h. (Melbourne, La Paz, and Kodaikanal), 14h. (Toronto), 16h. (Taihoku), 20h. (Edinburgh).

May 24d. Records at 0h. (San Fernando), 2h. (Kodaikanal), 3h. (Rocca di Papa), 15h. (Zurich and Stonyhurst), 16h. (Taihoku and Zi-ka-wei), 17h. (Melbourne and Riverview), 18h. (Perth and Riverview), 19h. (La Paz (2) and Helwan), 23h. (Riverview).

1918. May 25d. 19h. 29m. 25s. Epicentre 31°0S. 91°0W.

A = -0.15, B = -0.857, C = -0.515; D = -1.000, E = +0.017;
G = +0.009, H = +0.515, K = -0.857.

In making this determination it has been found necessary to assume a depth of focus 0.015; without taking such a measure it was found impossible to bring the North American observations into line with those of Riverview, La Paz, and South American stations.

Station and Component.	Machine.	Corr. for Focus	Δ	Azimuth.	P.	O—C.	S.	O—C.	L.	M.
					M. S.	S.	M. S.	S.	M.	M.
Cipolletti	M.	-0.6	20.3	119	2 11	?	—	—	—	2.9
Andalgalá	N.	-0.6	21.8	87	4 47	- 8	—	—	—	10.6
	M.	-0.6	21.8	87	4 41	-14	—	—	—	11.4
Pilar	N.	-0.7	23.1	99	5 11	+ 1	—	—	—	11.4
	M.	-0.7	23.1	99	5 5	- 5	—	—	—	9.6
La Quiaca	N.	-0.8	24.2	75	5 29	+ 8	5 53	? PR ₁	—	11.2
	E.	-0.8	24.2	75	5 23	+ 2	5 59	? PR ₁	—	10.9
La Paz	Bi.	-0.8	25.3	60	i 5 27	- 6	i 10 0	+ 6	12.7	13.7
Balboa Hts.	E.	-1.3	41.5	17	7 8	-49	—	—	16.3	16.7
	N.	-1.3	41.5	17	7 10	-47	—	—	13.4	13.7
Rio de Janeiro	E.	-1.4	43.1	91	e 8 11	+ 2	14 29	- 2	21.6	22.2
Vieques	N.	-1.7	55.0	30	e 9 29	+ 1	(17 0)	0	17.0	—
Cheltenham	B.O.	-2.0	71.0	11	11 14	+ 3	19 10	-64	28.6	32.9
Washington	Mar.	-2.0	71.1	10	11 9	- 3	20 13	- 2	e 28.6	—
Georgetown	—	-2.0	71.1	10	11 10	- 2	(20 30)	+15	20.5	—
Ann Arbor	E.	-2.0	73.6	5	—	—	20 47	+ 2	33.6	34.6
	N.	-2.0	73.6	5	12 41	+74	21 23	+38	34.3	34.9
	B.	-2.0	73.6	5	11 59	+32	21 29	+44	34.9	37.3
Ithaca	N.	-2.0	74.5	10	e 11 13	-20	e 20 49	- 7	—	—
	E.	-2.0	74.5	10	e 11 18	-15	e 20 54	- 2	31.4	—
Berkeley	—	-2.0	74.8	334	e 11 20	-15	—	—	—	—
Toronto	M.	-2.0	75.4	8	—	—	(22 5)	+58	e 31.4	33.4
Harvard	E.	-2.0	75.6	13	e 11 33	- 7	20 55	-14	e 34.5	—
	N.	-2.0	75.6	13	11 34	- 6	21 8	- 1	34.8	—
Northfield	B.O.	-2.0	77.0	12	—	—	e 21 23	- 3	34.6	—
Ottawa	—	-2.1	77.6	10	i 11 49	- 3	21 35	+ 3	e 36.6	—
Honolulu	M.	-2.1	82.9	301	e 12 47	+23	23 23	+50	35.4	37.2
Victoria	M.	-2.1	84.5	339	11 0?	-92	22 0?	-50	35.5	47.0
Cape Town	M.	-2.1	87.1	129	12 41	- 7	22 53	-26	45.2	47.2
Sydney	—	-2.2	92.5	228	25 35?	? S	(25 35?)	+78	31.0	32.0
Riverview	—	-2.2	92.7	228	e 13 5	-14	e 23 41	-38	e 43.2	45.1
Melbourne	M.	-2.2	93.7	222	—	—	(23 23)	-66	31.0	31.4
San Fernando	—	-2.2	104.1	55	17 35	?	—	—	28.1	35.6
Coimbra	—	-2.2	104.3	51	e 17 11	?	i 27 25	+69	48.2	54.1
Tortosa	—	-2.2	110.8	51	19 2	? PR ₁	28 17	+62	38.7	38.8
Algiers	B.M.	-2.2	111.0	59	e 18 48	? PR ₁	28 5	+48	51.6	57.6
Barcelona	—	-2.2	112.1	51	e 19 4	? PR ₁	i 28 43	+76	39.1	59.8
Bidston	M.S.	-2.2	113.3	40	19 35	? PR ₁	26 47	-51	—	40.9
Stonyhurst	M.	-2.2	113.8	40	i 17 35	?	i 26 59	-43	—	59.8
Eskdalemuir	G.	-2.2	113.9	38	19 20	? PR ₁	28 47	+64	43.6	—
Edinburgh	M.	-2.2	114.1	37	19 5	? PR ₁	—	—	—	36.1
Kew	M.	-2.2	114.2	41	18 35	? PR ₁	—	—	—	60.6
Paris	—	-2.2	115.0	44	i 19 44	? PR ₁	e 29 9	+77	49.6	55.6
Uccle	—	-2.2	116.7	43	e 19 41	? PR ₁	e 29 23	+77	e 55.6	—
Moncalieri	S.	-2.2	117.1	50	19 50	? PR ₁	29 20	+71	35.7	—
De Bilt	—	-2.2	117.1	42	e 14 57	-23	29 36	+87	57.6	59.9
Zurich	—	-2.2	118.4	47	e 19 5	? PR ₁	—	—	—	—
Rocca di Papa	Ag.	-2.2	119.6	54	e 20 10	? PR ₁	—	—	—	41.7
Mauritius	M.	-2.3	120.9	142	36 11	? SR ₁	—	—	—	62.2
Pola	W.	-2.3	121.3	51	e 20 23	? PR ₁	e 30 5	+82	e 44.8	65.9
Zagreb	W.	-2.3	123.0	51	i 20 30	? PR ₁	e 22 51?	?	—	55.6
Lemberg	B.O.	-2.3	128.9	46	21 5	? PR ₁	—	—	—	31.3
Helwan	M.	-2.4	130.8	73	(16 11)	- 9	16 11	? P	—	20.1
Batavia	W.	—	139.3	206	e 20 35	[+57]	—	—	—	—
Manila	W.	—	146.5	246	e 19 47	[3]	23 35	? PR ₁	25.8	26.9
Zi-ka-wei	—	—	152.3	280	e 19 4	[-55]	—	—	—	—
Colombo	M.	—	154.4	159	46 35	?	—	—	85.1	94.0
Kodaikanal	M.	—	156.6	150	41 53	?	—	—	85.4	87.4

For Notes see next page.

NOTES TO MAY 25d. 19h. 29m. 25s.

Additional records: La Quiaca records MN as +1.2m. Comparing this with ME this is probably a misprint for 10m. later. La Paz $i = +10m.50s.$ and +11m.47s., $T_0 = 19h.29m.9s.$ Rio de Janerio SE = +14m.35s. Vieques, eLE = +16.9m. Washington L = +31.6m., $T_0 = 19h.29m.30s.$ Georgetown records S as L for both components, and gives as SE and SN respectively, +15m.59s. and +15m.55s. Toronto gives S as L. Harvard $T_0 = 19h.29m.34s.$ Northfield eL = +28.4m. Ottawa $i = +26.4m., L = +43.6m.,$ and +58.6m., $T_0 = 19h.29m.26s.$ Sydney M = +47.6m. Riverview eS = +25m.46s., eSR₂ = +30m.17s. and +30m.52s., $T_0 = 19h.29m.24s.$ Melbourne S is given as SR₁. PR₁, given as S, = 19m.35s., SR₂ = +25m.41s. San Fernando MN = +34.6m. Coimbra SN = +27m.27s., iSR₁ = +33m.23s., LN = +46.3m., MN = +54.0m. Barcelona $i_2 = +34m.4s.$ Eskdalemuir SR₁ = +34m.24s. Paris e = +18m.35s. Uccle SR₁ = +35m.35s. De Bilt PR₁ = +19m.48s., ME = +29m.48s., mN = +29m.49s., LN = +59.6m., MN = +60.2m. Epicentre 30° 0S., 92° 0W. Zagreb eNW = +18m.54s., MNW = +66.6m. Lemberg $i = +22m.23s.$ Helwan gives P = +15m.41s.

May 25d. Records also at 1h. (San Fernando), 3h. (Taihoku), 11h. (Denver, Helwan, and La Paz), 14h. (Riverview), 16h. (Helwan), 18h. (La Paz), 20h. and 22h. (Mizusawa), 23h. (De Bilt).

May 26d. Records at 2h. (Colombo), 5h. (San Fernando), 10h. (Ottawa), 19h. (Batavia (2), Manila, and Pompeii), 20h. (Helwan, Riverview, and Colombo).

May 27d. 16h. 8m. 41s. Epicentre close to Uccle, which records iP at the above time. De Bilt ($\Delta = 1^\circ.4$) gives P = +23s., L = +50s., ME = +1.0m. Paris ($\Delta = 2^\circ.2$) gives eP = +43s., eS = +1m.17s., L = +1.6m.

May 27d. Records also at 0h. (San Fernando), 10h. (Helwan), 12h. (Denver), 13h. (Batavia), 14h. (Oaska).

May 28d. 8h. 21m. 9s. Epicentre near Uccle (as on May 27d.). De Bilt ($\Delta = 1^\circ.4$) gives P = +25s.

May 28d. Records also at 0h. (San Fernando), 5h. (Rocca di Papa), 14h. (Tacubaya), 16h. (Denver and Mizusawa), 21h. (San Fernando).

May 29d. Records at 0h. (La Paz), 2h. (Zagreb), 12h. (Zagreb (2)), 13h. (Deuver), 16h. (Moncalieri).

May 30d. Records at 0h. (Manila), 1h. (San Fernando), 5h. (Helwan and Kodai-kanal), 8h. (La Paz), 16h. (Helwan), 19h. (San Fernando), 22h. (Ottawa), 23h. (De Bilt).

May 31d. 5h. 5m. 40s. (I) } Epicentre 37° 0N. 143° 0E. (as on 1915 Nov. 18d.).
5h. 19m. 0s. (II) }

An epicentre at about 40° 5N. 143° 5E. would suit the recorded Tokyo observations (P = +1m.27s., S = +2m.40s.) in each case, as also Mizusawa and De Bilt, but would not suit Osaka and Kobe, and would make the negative residual for Zi-ka-wei still larger.

$$A = -.638, B = +.481, C = +.602; \quad D = +.602, E = +.799;$$

$$G = -.481, H = +.362, K = -.799.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
(I) Mizusawa	E.	2.6	327	0 37	- 4	1 10	- 2	—	—
(I)	N.	2.6	327	0 38	- 3	1 18	+ 6	—	—
(II)		2.6	327	0 43	+ 2	1 17	+ 5	—	—
(I) Tokyo		2.9	243	1 27	?S	(1 27)	+ 7	(2.7)	—
(II)		2.9	243	1 28	?S	(1 28)	+ 8	(2.7)	—
(I) Osaka		6.5	252	—	—	3 0	+ 3	4.4	5.2
(II)		6.5	252	—	—	3 0	+ 3	4.3	5.1
(II) Kobe		6.8	253	—	—	e 3 4	+ 7	4.2	4.4
(I) Zi-ka-wei		18.7	258	e 2 52	-93	—	—	—	—
(II) Eskdalemuir		83.2	340	—	—	—	—	45.0	—
(II) De Bilt		83.7	336	—	—	e 22 36	-30	e 46.0	47.2

Additional records: Mizusawa (II) gives SN = +1m.23s. Tokyo (I) and (II). It has been assumed above that the recorded P is S, and S is L, but see note at head. Osaka (I) MN = +5.2m., (II) MN = +5.3m. De Bilt e = +32m.12s.

1918. May 31d. 8h. 46m. 21s. Epicentre 45°·1N. 147°·2E.

A = -·593, B = +·382, C = +·708 ; D = +·542, E = +·841 ;
G = -·595, H = +·384, K = -·706.

Station and Component.		Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
			°	°	M. S.	S.	M. S.	S.	M.	M.
Mizusawa	N.	O.	7·5	219	1 53	- 1	3 16	- 8	—	—
	E.	O.	7·5	219	1 54	0	3 14	-10	—	—
Tokyo		O.	11·0	213	2 33	-11	4 35	-19	—	—
Osaka		O.	13·8	225	3 33	+10	—	—	6·5	10·0
Kobe		O.	13·9	226	e 3 30	+ 5	(6 3)	- 3	6·0	6·8
Zi-ka-wei		—	24·4	244	5 32	0	9 53	+ 1	12·2	13·0
Taihoku		O.	28·8	235	—	—	e 11 29	+16	—	—
Manila		W.	37·7	224	e 7 27	- 9	(13 25)	- 9	13·4	—
Honolulu		M.	50·4	98	e 14 51	?	—	—	e 19·4	22·2
Eskdalemuir		G.	76·5	342	e 12 1	+ 3	i 21 45	+ 2	40·3	—
De Bilt		—	77·5	337	12 6	+ 2	21 56	+ 1	e 35·6	40·8
Bidston		M.S.	78·2	341	12 3	- 5	23 21	+79	—	52·2
Uccle		—	78·8	337	e 12 9	- 3	e 22 3	- 7	—	46·6
Zagreb		W.	79·4	327	e 12 15	0	i 22 17	+ 1	41·6	—
Shide		M.S.	80·3	340	—	—	i 22 27	0	—	—
Zurich		—	80·6	332	e 12 22	- 1	22 31	+ 1	—	—
Pola		W.	80·9	329	—	—	e 22 21	-13	—	—
Paris		—	81·1	337	i 12 25	- 1	i 22 35	- 1	40·6	50·6
Moncalieri		S.	83·0	332	—	—	e 23 56	+59	—	—
Rocco di Papa		Ag.	84·1	328	i 12 38	- 5	—	—	—	—

Additional records : Osaka gives MN = +7·5m. Zi-ka-wei SR₁N = +10m.11s., SR₁E = +10m.21s., SR₂N = +10m.35s. De Bilt eLN = +37·6m., MN = +47·4m., T₀ = 8h.46m.35s. Zagreb iNE = +15m.55s. Rocca di Papa e = +12m.59s., eL? = +22·8m., M = +23·8m. This appears to be a record on a different instrument.

May 31d. Records also at 2h. (Helwan and Mizusawa), 4h. (Manila), 9h. (Mizusawa), 10h. (Taihoku and La Paz), 11h. (Kobe, Mizusawa, and Osaka), 15h. (La Paz), 17h. (Mizusawa (2)), 19h. (La Paz), 20h. (San Fernando), 21h. (De Bilt, Melbourne, Eskdalemuir, Edinburgh, and Helwan), 22h. (La Paz).

June 1d. 5h. 30m. 30s. Epicentre 39°·0S. 64°·0W.

A = +·341, B = -·698, C = -·629 ; D = -·899, E = -·438 ;
G = -·276, H = +·566, K = -·777.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Cipolletti	3·2	270	0 48	- 2	—	—	—	—
Chacarita	6·2	47	6 48	?L	—	—	(6·8)	—
Andalgala	11·5	350	5 24	?S	(5 24)	+17	(5·3)	7·8
La Paz	22·8	350	5 18	+ 3	8 23	-58	13·3	14·2
Paris	105·6	39	—	—	—	—	e 60·5	62·5
Kew	106·1	36	—	—	—	—	—	73·5
Rocca di Papa	106·5	49	—	—	e 29 48	+171	(e 58·8?)	—
Eskdalemuir	107·5	32	—	—	—	—	61·5	—
Edinburgh	107·9	31	62 30	?L	—	—	62·5	—
De Bilt	109·0	37	—	—	—	—	e 60·5	62·6
Helwan	112·1	69	6 30	?	—	—	—	—

Additional records : Andalgala gives S as P and L as S. La Paz T₀ = 5h.30m.40s. Rocca di Papa L given as eP? and L = +71·6m. De Bilt eLN = +61·5m.

June 1d. 8h. 23m. 40s. Epicentre $38^{\circ}5'N$, $146^{\circ}0'E$. (as 1916 July 16d.).

A = -·649, B = +·438, C = +·622; D = +·559, E = +·829;
G = -·516, H = +·348, K = -·783.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mizusawa	E.	3·8	274	—	—	1 39	- 5	2·3	—
	N.	3·8	274	—	—	1 42	- 2	2·3	—
Tokyo		5·7	243	1 51	+23	3 4	?L	(3·1)	—
Osaka		9·3	249	—	—	3 10	-60	4·5	5·3
Zi-ka-wei		21·3	259	e 4 59	+ 2	8 51	+ 1	—	12·9
Eskdalemuir		82·6	343	—	—	—	—	44·3	—
De Bilt		83·8	337	—	—	e 22 50	-17	43·3	49·3
Bidston		84·3	342	51 38	? L	—	—	(51·6)	56·5
Zagreb		84·5	329	—	—	—	—	46·7	54·3
Uccle		84·6	337	—	—	—	—	—	54·3
Rocca di Papa		89·1	327	—	—	e 25 38	+94	e 45·2?	50·6

Additional records: Osaka gives MN = +5·5m. Zi-ka-wei MN = +12·1m.
Zagreb MNW = +51·3m.

June 1d. 14h. 17m. 30s. Epicentre $10^{\circ}5'S$, $161^{\circ}0'E$. (as on 1917 November 30d.).

A = -·930, B = +·320, C = -·182; D = +·326, E = +·946;
G = +·172, H = -·059, K = -·983.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview		25·0	200	e 5 48	+10	e 10 18?	+15	12·8	13·7
Sydney		25·1	199	e 5 42	+ 3	—	—	12·8	15·0
Melbourne		30·9	205	(6 24)	-13	11 30	-20	15·9	18·7
Colombo		82·7	278	32 30	?L	—	—	(32·5)	—
Kodaikanal		85·7	281	64 36	?L	—	—	(64·6)	—
Mauritius	N.	98·4	248	50 54	?L	—	—	(50·9)	52·6
	E.	98·4	248	50 6	?L	—	—	(50·1)	53·0
Ithaca		120·9	47	—	—	e 36 0	?SR ₁	—	—
Helwan		129·4	300	27 30	?	—	—	—	—
Eskdalemuir		133·5	348	19 30	[+ 4]	—	—	—	—
Zagreb		133·8	326	20 30	[+62]	—	—	82·5	100·5
De Bilt		134·0	340	—	—	e 24 30	?	e 77·5	85·2
Stonyhurst		134·7	346	39 48	?SR ₁	—	—	—	85·8
Uccle		135·4	339	e 20 30	[+59]	—	—	—	88·5
Paris		137·6	339	—	—	—	—	e 88·5	92·5
San Fernando		151·6	338	82 30	?L	—	—	93·5	121·0

Additional records: Riverview gives MZ = +15·1m. Melbourne gives its
P as PR₁. Zagreb MNW = +99·9m. Stonyhurst M = +98·2m. San
Fernando MN = +111·5m.

June 1d. Records also at 4h. (Mizusawa), 8h. (La Paz), 9h. (Tortosa), 13h. (Mizusawa), 14h. (Taihoku), 15h. (Colombo), 17h. (Mizusawa and Tokyo), 21h. (De Bilt), 23h. (San Fernando, Mizusawa, Tokyo, Taihoku, and Osaka.).

June 2d. Records at 0h. (Stonyhurst), 1h. (Taihoku), 5h. (Osaka, Tokyo, Mizusawa, and La Paz), 13h. (Victoria, La Paz, De Bilt, and Toronto), 16h. (Monte Cassino), 19h. (Taihoku), 21h. (Mizusawa), 22h. (La Paz), 23h. (Rio de Janeiro and Tokyo).

1918. June 3d. 0h. 3m. 12s. Epicentre 0°4S. 20°0W.

A = +.940, B = -.342, C = -.007; D = -.342, E = -.940;
G = -.007, H = +.002, K = -1.000.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
San Fernando	—	39.0	18	7 36	-10	13 48	-4	22.8	24.8
Coimbra	W.	42.0	13	8 0	-11	14 21	-14	20.5	22.0
Algiers	B.M.	42.5	27	18 4	-11	14 28	-14	21.8	23.3
Tortosa	—	45.1	22	8 23	-11	15 6	-10	20.2	29.4
Barcelona	—	46.0	23	18 35	-5	15 22	-4	21.5	29.1
Marseilles	Ma.	47.3	24	19 0	+11	10 51	? PR ₁	27.8	—
Cape Town	M.	49.1	137	—	—	15 48	-19	23.8	26.8
La Quiaca	M.	49.5	241	17 12	? S	(17 12)	+59	26.6	—
Chacarita	B.O.	49.6	222	—	—	17 18	+64	27.6	32.0
La Paz	Bi.	50.1	292	9 8	0	16 21	+1	22.8	25.6
Rocca di Papa	Ag.	51.5	31	19 11	-6	16 33	-5	e 26.0	29.6
Moncalieri	S.	51.6	25	9 14	-3	16 40	+1	25.1	36.9
Pompeii	O.A.	51.7	33	19 33	+15	17 2	+22	e 27.0	33.0
Milan	—	52.6	25	9 30	+6	—	—	—	12.7
Paris	—	52.9	18	19 26	+1	16 52	-3	26.8	27.8
Shide	M.	53.6	15	9 28	-2	17 0	-4	30.0	33.1
Zurich	—	53.9	24	e 9 31	-1	17 5	-3	—	—
Pola	W.	54.3	29	19 34	-1	17 8	-5	27.4	30.7
Kew	M.	54.5	15	16 48	? S	(16 48)	-27	—	35.8
Uccle	—	55.2	18	19 41	+1	17 25	+1	e 26.8	34.8
Zagreb	W.	55.3	30	19 46	+5	17 33	+8	28.8	37.8
Athens	—	55.6	41	9 49	+6	17 35	+6	e 23.6	34.0
Bidston	M.S.	55.6	12	9 42	-1	17 12	-17	—	28.5
Stonyhurst	M.	56.2	12	e 9 48	+1	17 12	-24	23.6?	24.0
De Bilt	—	56.6	18	9 54	+4	17 47	+6	e 29.8	30.7
Helwan	M.	57.4	53	9 48	-7	18 6	+15	—	34.5
Eskdalemuir	G.	57.4	11	9 55	0	17 54	+3	27.3	28.7
Edinburgh	M.	57.9	11	9 48	-10	—	—	—	28.3
Cipolletti	M.	58.5	223	17 36	? S	(17 36)	-29	28.1	46.6
Dyce	Ma.	59.4	11	10 18	+10	18 26	+10	26.8?	29.0
Harvard	E. B.O.	62.7	320	10 29	-1	19 4	+7	e 25.8	—
	N. B.O.	62.7	320	10 33	+3	19 7	+10	e 26.5	27.9
Lemberg	B.O.	62.7	30	115 44?	?	19 24	+27	39.5	45.7
Washington	Mar.	65.3	314	10 52	+5	19 36	+7	31.8	—
Georgetown	—	65.3	314	e 10 53	+6	19 39	+10	e 27.1	—
Ithaca	N. B.O.	66.3	318	e 10 50	-4	19 48	+7	27.1	—
	E. B.O.	66.3	318	e 10 53	-1	20 0	+19	—	—
Ottawa	—	67.0	321	—	—	e 19 54	+4	e 26.8	—
Toronto	M.	68.7	318	—	—	20 30?	+20	36.7	41.0
Ann Arbor	B.	71.2	316	21 6	? S	(21 6)	+26	26.0	—
Mauritius	E. M.	78.5	111	21 42	? S	(21 42)	-24	40.8	43.4
Kodaikanal	M.	97.4	80	—	—	—	—	53.2	57.3
Victoria	M.	99.2	319	28 22	?	—	—	46.1	54.4
Colombo	M.	99.8	83	23 48	?	50 48	? L	(50.8)	—
Berkeley	—	100.0	308	—	—	—	—	e 47.8	—
Batavia	W.	126.5	98	—	—	—	—	e 65.8	—
Zi-ka-wei	—	132.3	46	—	—	—	—	e 71.4	78.5
Melbourne	M.	139.4	162	—	—	—	—	82.1	87.8
Riverview	—	144.9	167	e 19 48	[0]	e 27 12?	?	e 60.5?	83.3

Additional records: San Fernando gives also P = +7m.48s. (O-C. = +2s.).
Coimbra PR₁N = +9m.35s., SR₁E = +17m.25s., SR₁N = +17m.31s., LN = +19.6m., MN = +21.0m., T₀ = 0h.3m.10s. Algiers T₀ = 0h.3m.11s.
Barcelona PR₁ = +10m.21s., SR₁ = +18m.49s., MN = +30.6m. La Quiaca SN = +26m.6s. La Paz PR₁ = +11m.13s., T₀ = 0h.3m.16s.
Moncalieri MN = +28.0m. Paris T₀ = 0h.3m.19s. Pola MN = +30.3m.
Zagreb iNE = +13m.3s. and iNW = +13m.9s., MNW = +31.8m. Athens eLN = +24.4m., MN = +41.5m., T₀ = 0h.3m.19s. Stonyhurst M = +32.0m. De Bilt mE = +17m.56s., mN = +17m.57s., MN = +34.3m., T₀ = 0h.3m.17s., Epicentre 0°7S. 19°8W. Graz T₀ = 0h.3m.17s., Epicentre 6°0N. 30°0W. Eskdalemuir MN = +38.5m. Dyce M = +29.9m. and +37.0m. Harvard T₀ = 0h.3m.7s. Lemberg eS = +22m.42s. Washington L = +27.1m. Toronto LE = +28.6m. Mauritius PN = +20m.36s. Colombo P? = +44.8m. Zi-ka-wei MN = +75.3m. Riverview e? = +30m.18s., eL? = +42.3m., M = +48.3m., eS? = +50m.48s., MN = +81.7m.

June 3d. Records also at 2h. (La Paz, Tokyo, and Zagreb), 3h. (Calcutta and Riverview), 6h. and 9h. (Taihoku), 11h. (Apia), 15h. (Tortosa and Barcelona), 17h. (Stonyhurst), 21h. (Rocca di Papa).

1918. June 4d. 4h. 3m. 23s. Epicentre 7°0S. 145°0E.

A = -·813, B = +·569, C = -·122; D = +·574, E = +·819;
G = +·100, H = -·070, K = -·993.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Riverview	—	27·4	169	e 5 57	- 5	(i 10 41)	- 7	e 12·6	17·4
Sydney	M.	27·4	169	6 13	+11	10 49	+ 1	13·4	15·9
Adelaide	M.	28·5	191	7 19	? PR ₁	(11 7)	- 1	—	18·3
Melbourne	M.	30·7	180	11 31	? S	15 43	? L	18·0	21·4
Manila	W.	32·2	312	e 6 57	+ 7	—	—	14·4	—
Perth	M.	36·9	224	9 9	? PR ₁	(13 54)	+32	13·9	—
Batavia	W.	37·9	269	e 7 37	0	—	—	—	17·6
Taihoku	O.	39·5	325	e 7 53	+ 2	14 2	+ 3	17·2	—
Osaka	O.	42·7	348	8 5	-11	14 22	-22	20·6	25·5
Kobe	O.	42·7	348	8 3	-13	(14 19)	-25	14·3	15·0
Tokyo	O.	42·9	354	9 1	+44	—	—	—	—
Zi-ka-wei	—	44·3	331	e 8 23	- 5	15 40	+34	—	23·4
Mizusawa	E. O.	46·3	356	8 29	-13	15 8	-24	—	—
	N. O.	46·3	356	8 27	-15	15 2	-30	—	—
Honolulu	M.	62·6	62	10 49	+20	—	—	26·4	30·8
Kodaikanal	M.	69·4	284	52 13	? L	—	—	(52·2)	—
Victoria	M.	96·4	42	26 1	? S	(26 1)	+41	48·5	55·8
Berkeley	—	96·4	52	—	—	—	—	41·8	—
Helwan	M.	114·0	300	19 37	? PR ₁	—	—	—	—
Vienna	—	120·2	323	—	—	—	—	e 61·6	—
Graz	W.	121·3	322	e 19 19	? PR ₁	—	—	—	—
Zagreb	W.	121·6	321	e 20 53	? PR ₁	e 30 27	? 61·6	—	—
De Bilt	—	124·2	331	—	—	e 30 54	+94	e 62·6	65·9
Edinburgh	M.	125·1	339	45 37	? L	—	—	(45·6)	78·1
Rocca di Papa	Ag.	125·4	318	e 20 55	? PR ₁	e 30 33?	+64	e 68·5	—
Uccle	—	125·4	331	23 37	? 62·6	—	—	e 62·6	67·6
Eskdalemuir	G.	125·5	338	e 20 47	? PR ₁	31 4?	+94	46·6	—
Toronto	M.	126·6	39	—	—	—	—	56·3	75·5
Bidston	M.S.	126·9	337	21 13	? PR ₁	31 49	+130	—	70·8
Moncalieri	S.	127·0	323	e 21 23	? PR ₁	33 21?	? 61·9	78·0	—
Paris	—	127·6	330	e 21 24	? RR ₁	—	—	e 63·6	66·6
Ottawa	—	128·0	36	e 20 13	? 58·6	e 30 19	+32	e 58·6	—
Washington	Mar.	130·5	43	—	—	—	—	e 69·3	—
Barcelona	—	132·4	322	—	—	e 57 59	? 67·4	82·6	—
Harvard	B.O.	132·4	36	—	—	—	—	67·8	—
Algiers	B.M.	134·3	316	—	—	—	—	e 76·6	85·6
Coimbra	—	139·3	329	e 23 37?	? PR ₁	e 34 37	? 70·4	83·2	—
La Paz	Hi.	139·5	126	19 45	[+ 6]	—	—	80·6	—

Additional records: Riverview iPS is taken as S, PR₁ = +6m.17s., eS = +10m.31s., iS = +10m.38s., MN = +18·2m., T₀ = 4h.3m.35s. Adelaide PR₁ is given as P and S as PR₁. Melbourne SR₁ = +16m.37s. Osaka MN = +24·4m., T₀ = 4h.3m.31s. Tokyo record one hour wrong? Zi-ka-wei MN = +24·4m. De Bilt e(PR₁) = +20m.56s., e(SR₁) = +37m.52s., eLN = +63·6m., MN = +75·4m. Toronto LE = +68·0m. and +72·1m. Moncalieri MN = +78·6m. Paris ME = +70·6m. Ottawa e = +10m.25s., e = +55m.37s. Harvard eN = +56m.47s., LN? = +66·3m., LN = +72·2m. La Paz PR₁ = +23m.14s.

1918. June 4d. 17h. 11m. 36s. Epicentre 19° OS. 177° OW.

A = -·944, B = -·049, C = -·326 ; D = -·052, E = +·999 ;

G = +·325, H = +·017, K = -·946.

The median residual for the antipodal stations is [+12], which seems to be partly due to error in T_0 and partly to the focus being rather higher than usual. But the quantities are small and no correction has been ventured.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Apia	W.	7·3	45	i 1 58	+ 7	3 24?	- 6	3·9	4·6
Riverview		31·9	236	i 6 55	+ 9	i 12 14	+ 7	14·1	15·9
Sydney	M.	31·9	236	i 6 48	+ 2	i 12 24	+17	16·7	18·0
Melbourne	M.	38·5	232	7 36	- 6	13 54	+ 9	20·3	23·4
Adelaide	M.	42·2	238	9 54	? PR ₁	(14 36)	- 2	—	26·0
Honolulu	M.	44·4	26	15 0	? S	(15 0)	- 7	17·8	21·0
Perth	M.	60·7	243	14 18	? PR ₁	(18 34)	+ 2	32·5	—
Manila	W.	69·7	294	e 11 22	+ 7	—	—	—	—
Mizusawa	O.	70·1	327	11 15	- 3	20 7	-20	—	—
	O.	70·1	327	11 17	- 1	20 6	-21	—	—
Osaka	O.	70·2	320	11 25	+ 7	20 51	+23	30·4	39·2
Kobe	O.	70·3	320	e 11 12	- 7	—	—	37·2	39·3
Batavia	W.	74·9	269	e 11 24	-24	—	—	—	—
Berkeley	—	76·6	41	—	—	e 21 49	+ 5	—	—
Lick	W.	76·8	42	e 28 24	? SR ₁	—	—	—	—
Zi-ka-wei	—	77·5	310	e 12 4	0	—	—	—	—
Victoria	M.	82·7	33	22 59	? S	(22 59)	+ 5	38·0	48·6
Cipolletti	M.	91·9	133	23 42	? S	(23 42)	-52	(50·2)	63·0
La Paz	Bi.	101·6	112	e 16 49	?	e 29 3	?	44·4	51·8
Colombo	M.	104·7	272	32 24	? SR ₁	40 24	?	54·4	70·4
Ann Arbor	B.	105·0	50	28 24	? S	28 24	+92	53·4	—
Toronto	M.	108·4	49	—	—	—	—	50·7	61·1
Georgetown	—	109·4	54	—	—	e 28 31	+68	54·6	—
Washington	Mar.	109·4	54	—	—	—	—	52·9	—
Ithaca	B.O.	110·3	51	—	—	e 28 24	+53	52·5	—
Ottawa	—	111·0	48	e 18 8	? PR ₁	e 28 54	+77	56·4	—
Mauritius	M.	113·5	235	29 30	? S	(29 30)	+92	56·2	63·4
Harvard	B.O.	114·3	51	e 9 2?	?	16 15?	? P	e 57·9	—
Edinburgh	M.	143·0	6	37 39	? SR ₁	—	—	—	—
Eskdalemuir	G.	143·3	6	e 20 4	[+18]	e 41 15	?	76·4	—
Lemberg	B.O.	144·9	336	—	—	—	—	e 75·0	86·7
Bidston	M.S.	145·3	6	23 42	? PR ₁	—	—	—	85·1
De Bilt	—	146·9	358	20 0	[- 9]	—	—	e 82·4	—
Kew	M.	147·5	4	—	—	—	—	—	95·4
Shide	—	148·1	6	19 24	[- 29]	—	—	70·4	—
Uccle	—	148·2	358	19 57	[- 4]	e 30 24	-84	—	78·4
Vienna	—	149·0	343	i 20 2	[+ 8]	—	—	—	—
Hohenheim	—	149·9	352	i 20 8	[+12]	—	—	—	—
Graz	W.	150·0	343	20 10	[+14]	—	—	—	—
Paris	—	150·3	1	i 20 8	[-12]	—	—	76·4	80·4
Zagreb	W.	151·1	341	20 3	[+ 6]	—	—	64·4	77·4
Zurich	—	151·4	352	e 20 9	[+12]	—	—	—	—
Helwan	M.	152·1	298	23 24	? PR ₁	—	—	—	—
Pola	W.	152·6	343	e 20 12	[+12]	—	—	79·7	83·7
Milan	—	153·0	350	e 21 34	[+94]	—	—	—	—
Moncalieri	S.	153·6	352	20 32	[+31]	38 49?	?	75·6	88·4
Rocca di Papa	Ag.	155·9	342	e 20 4	[- 1]	—	—	—	80·6
—	—	155·9	342	e 20 18	[+15]	—	—	e 87·6	88·6
Coimbra	—	156·7	23	20 30	[+26]	—	—	67·0	82·4
Barcelona	—	157·6	0	20 24	[+18]	—	—	64·8	90·9
Tortosa	—	158·2	5	20 16	[+10]	—	—	65·4	85·6
San Fernando	—	160·8	23	45 54	? SR ₁	61 54	?	84·4	92·9
Algiers	B.M.	162·3	0	21 6	[- 57]	—	—	e 78·4	85·4

For Notes see next page.

NOTES TO JUNE 4d. 17h. 11m. 36s.

Additional records: Apia $M = +5.6m$. Riverview gives $iP = +7m.2s.$, $iPR_1 = +8m.15s.$ and $+9m.59s.$, $PS = +12m.36s.$, $MN = +15.5m.$, $MZ = +19.5m.$, $T_0 = 17h.12m.11s.$ Melbourne $PR_1 = +9m.24s.$, $SR_1 = +17m.30s.$ Adelaide gives PR_1 as P and S as PR_1 . Mauritius $MN = +57.6m$. Perth $S = +23m.4s.$, $SR_1 = +27m.12s.$, PR_1 is given as P and the true S is given as PR_1 . Mizusawa $T_0 = 17h.12m.1s.$ Osaka $MN = +39.0m.$, $T_0 = 17h.11m.34s.$ Zi-ka-wei $MN = +36.4m.$ Cipolletti records L as S . Toronto $LE = +56.4m.$ Georgetown $eN = +28m.48s.$ Ithaca $eE = 34m.56s.$, $LN = +53.6m.$ Ottawa $e = +53m.24s.$, $L = +63.4m.$ and $+85.4m.$ Harvard $LN = +63.5m.$, $T_0 = 17h.5m.?$ Eskdalemuir $eL = +59.4m.$ and $L = +73.4m.$ Paris $MN = +86.4m.$ Zagreb $i = +20m.10s.$, $iNW = +20m.28s.$, $MNW = +78.4m.$ Pola $MN = +82.7m.$ Moncalieri $MN = +86.6m.$ Rocca di Papa gives one of its M 's an hour too soon. Coimbra $LN = +74.4m.$, $MN = +85.3m.$ Barcelona $LN = +80.8m.$ San Fernando $MN = +91.9m.$

June 4d. Records also at 0h. (La Paz), 1h. (San Fernando), 3h. (La Paz), 18h. (La Paz, Kodaikanal, and Capetown), 19h. (Mauritius), 20h. (Mizusawa), 23h. (Moncalieri and Rocca di Papa).

June 5d. 22h. 29m. 25s. Epicentre $22^\circ 08'S$, $174^\circ 00'E$. (as on 1915 Feb. 25d.).

$A = -.922$, $B = +.097$, $C = -.375$; $D = +.104$, $E = +.994$;

$G = +.373$, $H = -.039$, $K = -.927$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Apia	15.8	61	e 4 5	+16	—	—	e 8.1	11.6
Sydney	23.2	235	9 35	?S	(9 35)	+ 6	12.4	13.8
Riverview	23.2	235	e 5 17	- 2	i 9 29	0	e 12.1	13.3
Melbourne	29.5	231	—	—	—	—	15.6	19.4
Adelaide	33.5	239	14 41	?SR ₁	—	—	—	21.0
Perth	52.2	246	—	—	—	—	26.9	—
Manila	63.5	300	e 10 35	0	—	—	—	—
Victoria	89.9	36	—	—	—	—	—	49.1
Mauritius	104.8	241	50 47	?L	—	—	(50.8)	55.0
Helwan	145.7	291	77 35	?L	—	—	(77.6)	—
Eskdalemuir	146.6	357	—	—	—	—	63.6	—
Bidston	148.5	357	69 53	?	77 47	?L	(77.8)	—
De Bilt	N. 148.7	347	e 21 47	?	—	—	e 65.6	72.0
E. 148.7	347	e 22 47	?PR ₁	—	—	—	—	74.2
Zagreb	150.2	328	—	—	—	—	e 73.6	—
Paris	152.3	348	—	—	—	—	e 74.6	—

Additional records: Riverview gives $eSR_1 = +10m.46s.$, $MN = +12.7m.$, $T_0 = 22h.29m.24s.$ Mauritius $PN = +70m.41s.$

June 5d. Records also at 4h. (San Fernando), 6h. (Manila), 13h. (Osaka), 15h. (Edinburgh), 16h. (Tokyo), 20h. (Pola), 22h. (Athens).

June 6d. 18h. 14m. 16s. Epicentre $23^\circ 38'S$, $150^\circ 06'E$.

$A = -.800$, $B = +.451$, $C = -.396$; $D = +.491$, $E = +.871$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	10.5	177	i 2 37	+ 0	i 4 43	+ 0	i 4.8	8.0
Sydney	10.5	178	4 8	?S	(4 8)	-35	5.0	5.2
Melbourne	15.3	197	—	—	—	—	7.5	8.7
Adelaide	15.6	219	6 44	?S	(6 44)	- 2	—	8.8
Perth	31.8	247	—	—	—	—	14.3	—
Batavia	45.4	285	e 8 44	+8	—	—	—	—
Helwan	125.9	291	75 44	?L	—	—	(75.7)	—
Tortosa	149.4	312	20 7	[+12]	—	—	36.7	39.2

Additional record: Riverview $M_1 = +5.3m.$, $MZ_2 = +6.7m.$ Epicentre probably $24^\circ 08'S$, $154^\circ 00'E$.

June 6d. Records also at 15h. (Monte Cassino), 18h. (Helwan), 22h. (Lick, Athens, and Berkeley).

June 7d. 4h. 54m. 45s. Epicentre $27^\circ 00'N$, $121^\circ 00'E$. (as on 1917 July 5d.).

$A = -.459$, $B = +.764$, $C = +.454$; $D = +.857$, $E = +.515$;

$G = -.234$, $H = +.389$, $K = -.891$.

	Δ	Az.	P.	O-C.	L.	M.
			m. s.	s.	m.	m.
Taihoku	2.0	167	0 31	- 0	0.7	1.1
Hokoto	3.8	201	0 54	- 5	1.3	—
Zi-ka-wei	4.2	5	e 1 5	- 0	—	4.2
Manila	12.4	180	e 2 53	-12	—	—
Osaka	14.6	55	4 39	+65	—	17.2

Osaka gives $MN = +16.9m.$

1918. June 7d. 21h. 27m. 6s. Epicentre $18^{\circ}7'N$. $103^{\circ}3'W$.

A = -218, B = -922, C = +321; D = -973, E = +230;

G = -074, H = -312, K = -947;

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Tucson	N.	B.O.	15.2	335	3 57	+15		8.7	10.6
	E.	B.O.	15.2	335	3 56	+14		8.2	9.9
Denver		W.	21.0	356	6 54	?		8.9	9.9
St. Louis		W.	22.9	27	e 5 24?	+ 8	10 0?	+37	11.4?
Lick		W.	24.6	323	e 5 34	0			15.3?
Berkeley	N.		25.3	323	e 5 45	+ 4	e 10 29	+20	e 12.9
	E.		25.3	323	e 5 49	+ 8	e 10 32	+23	17.1
Ann Arbor	E.	B.	28.9	31	6 6	-11	12 30	+75	18.0
	N.	B.	28.9	31	6 0	-17	12 12	+57	17.6
Cheltenham	N.	B.O.	30.4	43	e 7 12?	+40			e 19.1
	E.	B.O.	30.4	43	e 7 0?	+28			e 20.3
Georgetown	E.		30.4	43	e 7 1	+29	11 44?	+ 3	e 17.0
	N.		30.4	43	e 7 5	+33	11 25?	-16	e 16.9
Washington		Mar.	30.4	43	e 6 22	-10	11 27?	-14	14.7?
Toronto		M.	32.0	34	i 7 48	? PR ₁	13 12	+64	i 21.3
Ithaca		B.O.	32.8	38			e 11 54	-27	
Victoria		M.	33.8	336	6 52	-11	12 49	+11	18.3
	Z.		33.8	336	6 42	-21			20.8
Ottawa			35.2	34	e 7 6	- 9	12 40	-18	20.7
Vieques		B.O.	35.9	84	e 23 29	? L			e 16.8
Harvard		B.O.	36.1	42	(8 7)	+44	i 13 0	-11	(23.5)
Northfield		B.O.	36.1	38			e 18 19	? L	21.6
La Paz		Bi.	49.4	133	e 9 6	+ 3	16 6	- 5	23.4
Honolulu		M.	51.3	283					21.9
Apia		W.	74.9	249					e 23.7
Dyce		Ma.	80.1	33					e 36.4
Edinburgh		M.	80.1	34	11 54	-26			37.9
Eskdalemuir		G.	80.2	35	12 21	+ 1	22 34	+ 9	49.9
Bidston		M.S.	80.9	36	12 12	-12	22 6	-28	—
Stonyhurst		M.	81.2	36	i 11 48	-38	i 22 42	+ 5	49.4
Coimbra			81.7	50	12 34	+ 5	22 50	+ 7	53.6
Shide			82.9	39	12 38	+ 3	22 58	+ 2	39.9
Kew		M.	83.2	38					45.9
Rio Tinto		M.	83.7	52	12 54	+14			51.1
San Fernando			84.5	53	23 24	? S	(23 24)	+10	50.9
Paris			85.9	39			e 23 39	+10	22.9
Uccle			86.2	37	12 55	+ 1	e 23 24	- 8	49.9
De Bilt	E.		86.3	36	12 55	0	23 22	-11	42.9
	N.		86.3	36	12 59	- 4	i 23 49	+16	e 41.9
Tortosa			87.8	47	12 58	- 6	23 56	+ 6	56.2
Barcelona			88.7	46			e 23 39	-21	46.1
Hohenheim			89.9	37	e 13 33	-18			47.2
Zurich			90.2	39					59.4
Moncalieri	S.		90.8	41	e 13 17?	- 3	24 1	-21	e 52.9
Algiers	B.M.		91.3	50	e 24 14	? S	(e 24 14)	-13	41.1
Vienna			94.2	36	e 13 30	- 9			55.8
Pola	W.		94.6	39	e 24 12	? S	(e 24 12)	-50	e 49.9
Zagreb	W.		95.3	38	e 13 38	- 7	24 15	-54	e 56.6
Rocca di Papa	Ag.		95.5	42	e 24 15	? S	(e 24 15)	-56	58.9
Lemberg	B.O.		97.2	31					e 45.6?
Riverview			113.0	240	e 45 54?	?			e 54.5
Helwan	M.		114.7	43	19 54	? PR ₁			e 53.8
Melbourne	M.		118.3	236					64.5
Cape Town	M.		126.4	119	65 6	? L			e 55.9
Colombo	M.		154.2	353	92 54	? L			(65.1)
									74.1
									(92.9)
									98.1

For Notes see next page.

NOTES TO JUNE 7d. 21h. 27m. 6s.

Additional records: Berkeley gives $T_0 = 21h.26m.53s.$ Ann Arbor $T_0 = 21h.25m.48s.$ Cheltenham PE? = +17m.15s., PN? = +17m.25s. Toronto $T_0 = 21h.28m.6s.$ Victoria $T_0 = 21h.26m.27s.$ Ottawa PR₁ = +8m.24s., SR₁ = +14m.36s., L = +20.9m., $T_0 = 21h.27m.10s.$ Harvard gives P at 26m.42s., and the true P as S. Also SE = +8m.33s., eE = +16m.0s., P? or L = +19m.57s., MN = +24.0m., $T_0 = 21h.16m.12s.$ La Paz $T_0 = 21h.27m.23s.$ Eskdalemuir $T_0 = 21h.27m.12s.$ Bidston PR₁ = +15m.57s. Coimbra LN = +46.9m., $T_0 = 21h.27m.22s.$ Uccle $T_0 = 21h.27m.30s.$ De Bilt eSR₁N = +29m.6s., eSR₁E = +29m.11s., eSR₂ = +33m.19s., $T_0 = +21h.27m.32s.$ Barcelona M = +64.6m. Moncalieri MN = 55.0m. Pola MN = +67.8m. Zagreb MNW = +59.9m. Rocca di Papa L = +59.6m. Riverview MN = +69.2m.

June 7d. Records also at 1h. (San Fernando), 6h. (Rio Tinto), 7h. (Zagreb), 9h. (Tacubaya), 10h. (Algiers), 11h. and 12h. (La Paz), 14h. (Manila and Riverview), 18h. (Zurich), 23h. (Athens).

June 8d. 20h. 13m. 12s. Epicentre $5^{\circ}0'N. 128^{\circ}0'E.$ (as on 1916 Feb. 14d. and 1916 June 9d.).

$$A = -.613, B = +.785, C = +.087; \quad D = +.788, E = +.616;$$

$$G = -.054, H = +.069, K = -.996.$$

It seems possible that the Manila S is one minute in error; and perhaps both P and S of Mizusawa; but without knowledge of these points improvement of the solution is uncertain.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	11.8	325	e 2 54	- 2	6 0	+46	7.6	9.3
Batavia	23.9	243	5 30	+ 3	9 37?	- 5	—	10.8
Osaka	30.5	12	6 43	+10	11 41	- 2	16.4	21.7
Mizusawa E.	36.1	17	6 32	-51	11 57	-74	—	—
Riverview	44.6	152	e 15 6	?S	(e 15 6)	- 4	e 24.1	32.8
Colombo	48.0	275	14 48	?S	(14 48)	-66	—	—
Kodaikanal	50.3	279	19 54	?SR ₁	—	—	—	—
Helwan	93.2	300	23 48	- ?S	(23 48)	-59	—	—
Zagreb	101.4	319	e 14 7	-10	—	—	54.8	—
De Bilt	105.2	328	—	—	e 27 18	+34	51.8	55.8
Edinburgh	107.2	334	58 48	?L	—	—	(58.8)	—
Eskdalemuir	107.5	333	31 48	?	—	—	—	—
Stonyhurst	108.1	332	—	—	—	—	—	61.8
Paris	108.3	326	—	—	—	—	54.8	—

Additional records: Manila gives MN = +9.5m., $T_0 = 20h.(12m.16s.).$ Batavia $T_0 = 20h.(13m.33s.).$ Osaka MN = +23.5m., $T_0 = 20h.13m.39s.$ Mizusawa N/S = +12m.3s., $T_0 = 20h.(12m.54s.).$ Riverview eS = +19m.24s., PS = +19m.49s., MN = +29.6m. De Bilt MN = +55.6m., Epicentre $5^{\circ}8'N. 124^{\circ}5'E.$

June 8d. Records also at 2h. (Tokyo), 3h. (Andalgala), 8h. (Athens), 10h. (Simla), 11h. (Tacubaya (3)), 12h. (Tacubaya), 14h. (Sydney and Rocca di Papa), 15h. (Tacubaya and Manila), 16h. (Athens (2)), 19h. (Zi-ka-wei), 23h. (San Fernando).

June 9d. Records at 2h. (Taihoku), 13h. (Rocca di Papa), 14h. (Pompeii), 15h. and 17h. (La Paz), 18h. (Manila), 19h. (Rio Tinto), 21h. (La Paz).

June 10d. 15h. 35m. 30s. Epicentre $4^{\circ}08.144^{\circ}5E$. (as on 1916 Aug. 3d.).

A = -·812, B = +·570, C = -·070; D = +·581, E = +·814;

G = +·057, H = -·041, K = -·998.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	29·8	309	e 7 3	+37	—	—	—	—
Sydney	30·5	169	11 30	?S	(11 30)	-13	15·2	17·5
Riverview	30·5	169	e 4 48	-105	i 10 48	-55	e 15·7	16·5
Melbourne	33·8	179	12 6	?S	(12 6)	-32	18·5	19·0
Batavia	37·6	265	e 9 30	?PR ₁	—	—	—	17·5
Osaka	39·6	348	8 14	+23	—	—	—	18·2
Mizusawa	E. 43·2	356	8 30	+10	14 51	0	—	—
N. 43·2	356	8 29	+ 9	14 54	+ 3	—	—	—
Colombo	65·5	279	19 30	?S	(19 30)	- 1	—	—
Helwan	112·0	301	23 30	?	—	—	—	—
De Bilt	121·4	332	—	—	e 29 30	+30	e 58·5	63·3
Eskdalemuir	122·5	339	—	—	—	—	51·5	—
Bidston	123·9	337	61 12	?L	—	—	(61·2)	69·5
Kew	124·2	334	—	—	—	—	—	67·5
Moncalieri	124·3	320	—	—	—	—	63·4	—
San Fernando	137·9	324	68 30	?L	—	—	(68·5)	—
La Paz	141·8	123	19 41	[- 2]	28 45	?	e 41·0	42·3

Additional records: Riverview gives $SR_1 = +12m.51s.$, $MZ = +22.6m.$ Mel-
bourne S = +16m.48s. Osaka MN = +17.6m. De Bilt e = +37m.36s.

June 10d. Records also at 1h. (San Fernando), 3h. (Rocca di Papa and Athens),
4h. (Zagreb), 5h. (Riverview), 14h. (Zi-ka-wei), 19h. (La Paz), 22h.
(Manila).

June 11d. 12h. 36m. 25s. Epicentre $19^{\circ}3N. 62^{\circ}5W$.

A = +·436, B = -·837, C = +·330; D = -·887, E = -·462;

G = +·153, H = -·293, K = -·944.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Vieques	3·0	249	—	—	—	—	2·6	3·3
Cheltenham	N. 23·1	330	5 16	- 2	9 29	+ 2	e 12·2	18·7
E. 23·1	330	5 18	0	9 28	- 1	e 12·6	17·3	—
Washington	23·3	330	5 19	- 1	9 16	-15	12·1	—
Georgetown	23·3	330	e 5 19	- 1	9 33	+ 2	11·7	—
Harvard	24·2	344	e 3 43	?	e 8 34	-74	13·6	—
Ithaca	E. 26·0	336	—	—	e 10 16	- 6	e 12·6	—
N. 26·0	336	—	—	—	e 10 11	-11	e 13·2	—
Northfield	26·3	344	5 33?	-18	10 5?	-23	12·9	—
Toronto	28·2	333	—	—	—	—	13·1	18·4
Ottawa	28·4	340	e 5 29	-43	—	—	e 13·0	—
Ann Arbor	E. 29·2	327	6 5	-15	9 35	?	15·1	20·9
E. 29·2	327	5 41	-39	—	—	—	15·6	20·9
N. 29·2	327	4 53	?	10 35	-45	16·1	20·8	—
La Paz	36·2	189	i 7 14	-10	13 7	- 6	20·0	22·7
San Fernando	51·9	58	16 35	?S	(16 35)	- 8	—	—
Berkeley	54·7	303	—	—	—	—	e 27·6	—
Bidston	56·5	38	—	—	—	—	—	28·6
Victoria	56·5	316	—	—	—	—	—	37·5
Eskdalemuir	56·9	36	13 35	?PR ₁	—	—	—	—
Stonyhurst	57·0	38	—	—	—	—	—	29·1
Edinburgh	57·1	35	17 35	?S	(17 35)	-12	—	36·1
Barcelona	58·5	53	—	—	—	—	e 28·6	—
Paris	59·3	44	—	—	e 17 35	-40	—	—
De Bilt	61·2	40	—	—	18 42	+ 4	e 29·6	32·6
Zagreb	68·4	47	e 11 13	+ 6	20 9	+ 2	36·9	—
Helwan	83·7	61	44 35	?L	—	—	(44·6)	—

Additional records: Vieques gives $MN = +2.9m.$ Cheltenham $T_0 = 12h.36m.25s.$ Georgetown $ePN = +5m.17s.$, $T_0 = 12h.36m.21s.$ Har-
vard $eE = +3m.12s.$, $eLN = +8.0m.$ Toronto $L = +11.9m.$ La Paz
 $T_0 = 12h.36m.14s.$ De Bilt $e = +22m.53s.$, $MN = +34.2m.$, Epicentre
 $19^{\circ}7N. 60^{\circ}8W$.

June 11d. Records also at 0h. (Taihoku), 6h. (Manila), 12h. (Rocca di Papa),
14h. (Zi-ka-wei), 15h. (Osaka, Taihoku, and Rocca di Papa), 18h. (Kobe),
19h. (Osaka and Manila), 21h. (Zagreb and Taihoku), 22h. (San Fer-
nando), 23h. (Mizusawa and Tokyo).

June 12d. 4h. 24m. 40s. Epicentre $43^{\circ}0'N$. $125^{\circ}0'W$. (as on 1914 Aug. 22d.).

A = -420, B = -599, C = +682; D = -819, E = +574;

G = -391, H = -559, K = -731.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	\circ	\circ	m. s.	s.	m. s.	s.	m.	m.
Berkeley	5.5	157	e 1 15	-10	—	—	—	3.8
Victoria	5.5	12	—	—	—	—	3.1	4.1
Lick	6.5	155	e 1 40	+ 1	—	—	—	—
Tucson	N. 15.5	129	4 10	+24	—	—	9.3	10.3
	E. 15.5	129	4 4	+18	—	—	9.3	10.3
Ann Arbor	30.1	77	6 20	- 9	11 32	- 4	19.5	20.4
Toronto	32.8	72	—	—	—	—	21.6	22.1
Ottawa	34.9	69	—	—	e 12 50	- 4	e 21.1	—
Ithaca	35.1	74	—	—	—	—	20.8	—
Washington	36.0	80	12 29?	?S	(12 29?)	-41	21.7	—
Georgetown	36.0	80	e 10 44	?	—	—	e 19.8	—
Cheltenham	36.2	80	—	—	e 19 29	?L	e 23.5	—
Harvard	38.9	72	e 7 54	+ 9	—	—	22.1	—
Edinburgh	69.6	31	29 5	?L	—	—	(29.1)	44.3
Eskdalemuir	70.0	31	—	—	—	—	35.3	—
Bidston	71.5	32	32 26	?L	—	—	(32.4)	46.0
Kew	74.1	32	—	—	—	—	—	47.3
Shide	74.7	34	—	—	—	—	—	46.0
De Bilt	E. 75.6	29	—	—	e 22 5	+32	e 36.3	47.5
	N. 75.6	29	—	—	—	—	e 38.3	45.5
Paris	77.4	32	—	—	—	—	e 45.3	48.3
Rio Tinto	81.8	45	46 20	?L	—	—	(46.3)	49.3
Moncalieri	82.5	32	e 45 3	?L	—	—	48.8	—
Zagreb	84.7	26	e 12 57	+11	23 26	+10	50.3	54.3
Rocca di Papa	87.1	30	e 16 44	?PR ₁	—	—	—	23.7
Helwan	104.0	21	71 20	?L	—	—	(71.3)	—

Additional records: Berkeley gives MN = +3.9m. Georgetown LN = +22.4m., eLE = +23.4m. Washington S? = +17m.40s. Cheltenham eLN = +22.4m. Harvard eN? = +5m.54s., eN = +11m.48s., eN = +19m.59s., LN = +21.4m. Zagreb MNW = +53.3m. Rocca di Papa M = +25.8m.

June 12d. Records also at 1h. (Pompeii), 7h. (Manila), 8h. (Helwan, La Paz, and Colombo), 15h. (La Paz), 18h. (Moncalieri), 22h. (San Fernando), 23h. (Batavia).

June 13d. 8h. 58m. 35s. Epicentre $14^{\circ}5'N$. $86^{\circ}0'W$.

A = +.068, B = -.966, C = +.250; D = -.998, E = -.070;

G = +.017, H = -.250, K = -.968.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	\circ	\circ	m. s.	s.	m. s.	s.	m.	m.
Cheltenham	25.6	17	5 45	+ 1	—	—	—	13.3
Washington	25.7	16	5 44	- 1	10 11	- 5	12.2	—
Georgetown	25.7	16	i 5 45	0	11 22	?SR ₁	e 14.7	—
Ann Arbor	N. 27.9	4	5 37	-30	10 19	-38	13.0	12.9
	E. 27.9	4	5 55	-12	10 31	-26	13.0	13.1
Ithaca	N. 29.1	14	e 6 39	+20	e 12 24	+65	—	—
	E. 29.1	14	e 6 54	+35	e 12 27	+68	—	—
Toronto	29.7	10	—	—	—	—	12.2	—
Harvard	N. 30.7	21	i 6 24	-11	11 33?	-13	e 15.0?	—
	E. 30.7	21	i 6 33	- 2	11 42?	- 4	—	—
Ottawa	32.1	12	6 36	-12	11 50	-20	14.9?	—
La Paz	35.6	151	7 27	+ 9	13 13	+ 9	18.4	20.0
Victoria	45.7	326	—	—	—	—	—	23.9
Edinburgh	74.0	35	31 25	?L	—	—	(31.4)	—
De Bilt	79.3	39	—	—	22 24	+ 9	e 38.4	39.6
Moncalieri	82.4	45	e 13 16	+44	—	—	20.6	—
Rocca di Papa	86.7	47	e 12 37	-20	16 3?	?PR ₁	—	26.4
Zagreb	87.6	43	e 15 25	?PR ₁	25 25	+97	—	—
Helwan	105.1	53	28 25	?S	(28 25)	+102	—	—

Additional records: Cheltenham gives MN = +13.4m. Georgetown T₀ = 8h.57m.15s. Ann Arbor SE = +9m.55s. Ithaca T₀ = 8h.57m.59s. Harvard T₀N? = 8h.58m.26s., T₀E? = 8h.58m.35s. Ottawa L = +16.4m., T₀ = 8h.58m.34s. La Paz PR₁ = +9m.33s., T₀ = 8h.58m.45s. De Bilt M = +52.0m.

June 13d. 18h. 13m. 55s. Epicentre $39^{\circ}0'N$, $27^{\circ}0'E$. (as on 1917 Aug. 8d.).

A = +.692, B = +.353, C = +.629; D = +.454, E = -.891;

G = +.561, H = +.286, K = -.777.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	2.8	248	0 47	+ 3	—	—	1.3	1.9
Helwan	9.8	158	8 5	?L	—	—	(8.1)	—
Pompeii	9.8	284	2 31	- 4	—	—	—	—
Zagreb	10.6	314	—	—	e 4 26	-19	—	7.6
Lemberg	11.0	350	—	—	—	—	e 6.2	6.9
Rocca di Papa	11.2	289	e 3 35	+48	—	—	—	5.6
Graz	11.6	318	e 5 41?	?L	—	—	(e 5.7?)	—
Moncalieri	15.5	299	—	—	e 6 40	- 4	e 9.5	—
De Bilt	20.0	318	—	—	—	—	e 10.9	—

Additional records: Athens gives MN = +1.5m. Zagreb iMNE = +7.3m.,
iMNW = +7.6m. Rocca di Papa e = +1m.18s., S = +4m.27s., M =
+5.0m.

June 13d. Records also at 0h. (De Bilt, Rocca di Papa, and Zagreb), 1h. (Helwan and Eskdalemuir), 6h. (La Paz), 8h. (Zi-ka-wei), 16h. (Batavia).

June 14d. Records at 1h. (Taihoku), 3h. (San Fernando), 8h. (Lick), 13h. and 15h. (La Paz), 17h. (Taihoku and San Fernando), 20h. (Tokyo), 21h. (Honolulu and Berkeley), 22h. Lick (2), 23h. (Bidston).

June 15d. Records at 0h. (La Paz, Eskdalemuir, Bidston, De Bilt, and Helwan), 1h. (La Paz), 4h. (Tokyo), 5h. and 10h. (Manila), 16h. (La Paz), 17h. (Zagreb), 19h. and 22h. (La Paz).

June 16d. 5h. 11m. 0s. Epicentre $8^{\circ}4'S$, $155^{\circ}8'E$.

A = -.902, B = +.406, C = -.146; D = +.410, E = +.912;

G = +.133, H = -.060, K = -.989.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	25.8	189	5 46	0	e 10 18	0	13.5	16.2
Melbourne	31.0	197	—	—	10 54	-57	15.4	16.4
Manila	41.5	303	e 7 58	- 9	—	—	10.0	—
Tokyo	46.6	342	8 40	- 4	—	—	—	—
Osaka	47.2	337	8 52	- 4	—	—	—	27.3
Batavia	48.5	269	e 9 0	+ 3	—	—	—	18.0
Honolulu	54.2	56	17 12	?S	(17 12)	+ 1	24.2	25.9
Victoria	90.3	41	35 33?	?	41 27	?L	49.3	54.8
Toronto	120.6	44	—	—	—	—	68.0	—
Capetown	121.4	221	61 36	?L	—	—	(61.6)	123.6
Ottawa	122.3	41	—	—	—	—	e 59.0	—
Helwan	124.0	300	37 0	?SR ₁	—	—	—	—
Zagreb	129.1	324	e 19 18	[- 2]	—	—	i 42.7	—
Edinburgh	129.7	345	62 0	?L	—	—	(62.0)	—
La Paz	129.9	120	18 44	[- 34]	—	—	62.9	80.4
De Bilt	130.2	337	e 23 0	?PR ₁	—	—	e 65.0	65.9
Pompeii	132.9	320	19 18	[- 7]	—	—	—	—
Rocca di Papa	133.4	322	e 19 28	[+ 2]	—	—	e 24.9	28.4
Moncalieri	134.2	328	22 55	?PR ₁	—	—	57.3	—

Additional records: Riverview gives PR₁ = +7m.24s., i = +10m.23s., PS =
+10m.33s., +11m.15s., +11m.43s., MN = +16.0m. Osaka MN =
+25.5m. Toronto LE = +74.6m. Rocca di Papa eP = +19m.25s.,
M = +19.6m.

June 16d. 12h. 27m. 36s. Epicentre $15^{\circ}1'N$. $84^{\circ}8'W$. (as on 1914 May 28d.).

$$A = +.087, B = -.962, C = +.261; \quad D = -.996, E = -.091;$$

$$G = +.024, H = -.259, K = -.966.$$

The European stations from Edinburgh to Paris in this table do not fit at all. They must have had some other origin, but have been included for the sake of completeness.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	8.0	140	1 58	- 3	(3 22)	-15	3.4	3.5
Washington	24.8	14	5 51	+15	10 21	+22	12.9?	—
Ann Arbor	27.2	2	5 54	- 6	10 36	- 9	—	14.4
	27.2	2	6 0	0	10 42	- 3	—	14.5
Ithaca	28.2	12	6 21	+11	11 13	+10	—	—
Toronto	29.0	8	—	—	11 48	+31	14.7	19.1
Harvard	N. 29.7	21	i 6 21?	- 4	11 22?	- 7	i 13.8?	—
	E. 29.7	21	i 6 35	+10	11 41	+12	i 13.0	—
Northfield	30.8	17	6 4?	-32	11 19?	-29	14.4	—
Ottawa	31.3	12	i 6 45	+ 4	e 11 54	- 2	e 14.9	—
La Paz	35.5	152	3 54	?	—	—	17.3	18.0
Victoria	45.9	325	—	—	—	—	29.1	—
Edinburgh	72.9	35	17 54	?	—	—	—	—
Eskdalemuir	72.9	36	18 24	?	—	—	—	—
Bidston	73.1	38	18 24	?	26 54	?SR ₁	—	36.1
Stonyhurst	73.3	38	—	—	—	—	—	21.9
Shide	74.3	40	—	—	e 21 19	+ 1	—	—
De Bilt	78.2	39	e 13 23	+75	e 22 1	- 1	39.7	40.3
Moncalieri	81.1	46	12 22?	- 4	i 22 28	- 8	34.4	—
Zagreb	86.3	43	e 12 51	- 4	i 23 22	-11	—	—
Helwan	103.8	53	24 24	?S	(24 24)	-127	—	—

Additional records: Balboa Heights PN = +2m.15s., LN = +3.6m., MN = +3.7m. Toronto SE = +9m.42s. Ithaca SE = +11m.12s., T₀ = 12h.27m.50s. Harvard iN? = +12m.32s., T₀N? = 12h.27m.45s., T₀E = 12h.27m.44s. Ottawa i = +8m.12s., SR₁ = +13m.0s., T₀ = 12h.27m.48s. Stonyhurst M = +37.4m. De Bilt e = +23m.30s., LN = +35.1m., MN = +35.3m. Moncalieri T₀ = 12h. (27m.50s.). Zagreb i = +13m.48s., eSNE? = +22m.33s. These records are given a day later.

June 16d. Records also at 0h. (San Fernando), 1h. (La Paz), 3h. (Colombo), 4h. (La Paz, Rio Tinto, and Marseilles), 7h. (Moncalieri), 10h. (La Paz), 15h. (Batavia), 16h. and 17h. (La Paz), 18h. (San Fernando), 21h. (Colombo).

June 17d. 16h. 41m. 25s. Epicentre $42^{\circ}5'N$. $85^{\circ}5'W$.

$$A = +.058, B = -.735, C = +.676; \quad D = -.997, E = -.078;$$

$$G = +.053, H = -.674, K = -.737.$$

The solution is unsatisfactory in that it does not account for the records at De Bilt or Ann Arbor. But no solution satisfying all the material suggests itself, after several trials.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ann Arbor	1.3	99	1 47	?	—	—	4.1	—
Ithaca	6.6	88	—	—	—	—	e 3.5	—
Washington	7.3	116	—	—	—	—	e 4.2	—
Georgetown	7.3	116	e 1 50?	- 1	4 25?	?L	(4.4)	—
Cheltenham	7.5	117	—	—	—	—	e 4.6	5.4
Ottawa	7.6	64	i 1 55	0	e 3 27	+ 1	e 4.5	—
Harvard	10.6	86	—	—	e 4 13	-32	4.6	—
De Bilt	58.1	46	—	—	e 15 35	?	—	—

Additional records: Ithaca gives eN = +3m.37s. Georgetown SN? = +4m.29s. Ottawa e = +2m.7s. Harvard LE = +8.0m.

June 17d. Records also at 0h. and 1h. (La Paz), 13h. (Osaka), 16h. (Sitka), 18h. (Riverview), 22h. (La Paz), 23h. (San Fernando).

June 18d. 15h. 45m. 15s. Epicentre $41^{\circ}0'N$. $13^{\circ}0'E$.

$$A = +.735, B = +.170, C = +.656.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
		m. s.	s.	m. s.	s.	m.	m.
Monte Cassino	0.7	0 7	- 4	—	—	—	0.2
Rocca di Papa	0.8	i 0 13	- 1	i 0 26	+ 4	—	0.6
Pompeii	1.2	0 25	+ 7	0 43	?L	(0.7)	—
Pola	3.9	e 1 14	?S	(e 1 14)	-33	e 1.7?	1.9
Zagreb N.E.	5.2	1 24	- 4	i 2 29	+ 7	i 2.7	3.2
N.W.	5.2	1 34	-14	2 25	- 3	i 2.9	2.9

No additional records.

June 18d. Records also at 0h. (Manila), 1h. (Tokyo), 3h. (Rio Tinto), 4h. (Algiers), 12h. (Mauritius), 13h. (Helwan), 16h. (Manila), 19h. (Helwan).

June 19d. 21h. 12m. 8s. Epicentre $39^{\circ}0'N$. $27^{\circ}0'E$. (as on 1918 June 13d. 18h.).

$$A = +.692, B = +.353, C = +.629; \quad D = +.454, E = -.891; \\ G = +.561, H = -.286, K = -.777.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Athens	2.8	248	e 0 47	+ 3	i 1 17	0	—	1.6
Pompeii	9.8	284	2 28	- 1	—	—	—	—
Zagreb	10.6	314	e 1 52	?	i 4 50	- 5	5.3	—
Rocca di Papa	11.2	289	i 3 40	?	—	—	—	4.5
De Bilt	20.0	318	—	—	—	—	e 9.8	10.8

Additional records: Athens gives MN = +2.2m., Zagreb i = +4m.33s. De Bilt MN = +10.7m.

June 19d. Records also at 1h. (Manila), 2h. (San Fernando), 6h. (Manila), 8h. (Tokyo), 12h. (Helwan and La Paz), 13h. (La Paz), 15h. (Helwan), 19h. (San Fernando), 20h. (Manila), 23h. (Riverview and Graz).

June 20d. Records at 3h. (San Fernando), 5h. (Balboa Heights and Manila), 6h. (Tokyo), 7h. (Manila), 17h. (Paris), 20h. (Andalgala), 21h. (Honolulu).

June 21d. 3h. 59m. 5s. Epicentre $22^{\circ}0'S$. $141^{\circ}0'W$.

$$A = -.721, B = -.583, C = -.375; \quad D = -.629, E = +.777; \\ G = +.291, H = +.236, K = -.927.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Honolulu	46.4	338	29 49	?L	35 7	?	37.8	38.4
Riverview	60.0	243	—	—	—	—	e 68.0	69.7
Berkeley	62.4	17	—	—	e 23 55	?SR ₁	—	—
Cipolletti	63.4	124	28 13	?	—	—	35.2	39.2
La Paz	68.4	100	11 7	0	20 8	+ 1	27.4	29.3
Chacarita	71.9	121	38 43	?L	—	—	(38.7)	—
Victoria	72.2	12	37 58	?L	—	—	(38.0)	42.9
Toronto	86.5	40	—	—	—	—	59.1	—
Capetown	120.8	160	70 49	?L	—	—	(70.8)	72.8
Edinburgh	134.1	32	61 55	?L	—	—	(61.9)	71.4
Eskdalemuir	134.3	32	—	—	—	—	60.9	—
De Bilt	140.3	32	—	—	—	—	61.9	66.0
Helwan	169.6	40	85 55	?L	—	—	(85.9)	—

Additional records: Riverview gives MN = +73.6m. Victoria L = +40.4m.

The above solution is clearly defective, but will serve to show the difficulties in reconciling all the observations. There were probably at least two shocks, one of them about 38° from Honolulu at 4h.21m.20s., according to the Honolulu record. The Berkeley record would fit in with this and place the epicentre a few degrees from Berkeley, and if we adopt the position $32^{\circ}0'N$. $119^{\circ}0'W$. as on 1917 November 7, and 1915 November 21, the European records (Eskdalemuir, De Bilt, and Edinburgh) will also fit fairly well; but, in view of the complete silence of other American stations, it seems impossible to put forward this solution seriously, though we may give the figures:

June 21d. 4h. 21m. 20s. At 32°·0N. 119°·0W., as on 1917 Nov. 7.

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.
Berkeley	6·4	(1 40)	+ 2	1 40	?P	—
Honolulu	36·2	7 34	+10	12 52	-21	15·6
Eskdalemuir	76·9	—	—	—	—	38·7
Edinburgh	76·6	39 40	?L	—	—	(39·7)
De Bilt	82·8	—	—	—	—	39·7
Capetown	144·5	48 34	?L	—	—	(48·6)

June 21d. 5h. 54m. 36s. Epicentre 19°·0N. 144°·0E.

A = -·765, B = +·556, C = +·326; D = +·588, E = +·809;
G = -·263, H = +·191, K = -·946.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tokyo	17·1	348	e 4 13	+ 7	—	—	—	—
Osaka	17·4	336	4 28	+18	—	—	—	10·2
Mizusawa	20·3	354	4 41	- 4	8 22	- 7	—	—
	20·3	354	4 39	- 6	8 19	-10	—	—
Manila	22·5	262	e 5 13	+ 2	9 17	+ 2	9·9	10·6
Zi-ka-wei	23·7	305	e 5 13	-12	10 52	?L	(10·9)	—

Additional records: Osaka MN = +11·4m., and Manila MN = +10·4m.

June 21d. Records also at 0h. (Lick and San Fernando), 3h. (Apia), 14h. (Lick and Manila), 15h. (Manila, La Paz, Batavia, and Zi-ka-wei), 16h. (Helwan, De Bilt, and Bidston), 20h. and 21h. (Taihoku), 22h. (Cape Town), 23h. (Lick).

June 22d. 22h. 5m. 30s. Epicentre 9°·5N. 84°·0W. (as on 1916 April 26d. 2h.).

A = +·103, B = -·981, C = +·165; D = -·995, E = -·105;
G = +·017, H = -·164, K = -·986.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Balboa Heights	4·4	96	1 20	+12	(1 56)	- 5	1·9	3·0
	4·4	96	1 14	+ 6	—	—	2·4	3·2
Vieques	20·0	62	4 47	+ 6	—	—	—	—
Cheltenham	29·9	11	e 6 39	+12	e 11 39	+ 7	e 17·7	19·8
Washington	30·0	11	(6 23?)	- 5	(11 57?)	+23	17·3	—
Georgetown	30·0	11	e 6 30	+ 2	10 53	-41	15·9	—
La Paz	30·4	149	6 25	-7	11 31	-10	15·9	16·6
Ann Arbor	32·8	0	6 36	-19	10 42	?	—	20·5
Ithaca	33·5	10	e 8 7	?PR ₁	e 14 18	?SR ₁	18·4	—
Toronto	34·4	6	—	—	—	—	15·5	20·4
Harvard	34·8	17	7 3	- 8	i 12 54	+ 2	e 17·6?	—
Ottawa	36·6	10	i 9 42	?	i 13 6	-12	e 20·5	—
Victoria	51·0	327	—	—	—	—	26·4	38·7
Edinburgh	77·1	35	21 30	?S	(21 30)	-20	—	52·2
Stonyhurst	77·4	37	15 0	?PR ₁	i 26 36	?SR ₁	—	42·8
Tortosa	79·7	50	13 20	+63	—	—	43·5	47·6
Paris	80·6	42	—	—	e 28 30	?SR ₁	38·5	—
Rocca di Papa	88·6	48	i 13 18	+10	e 22 12?	-107	28·5	30·3
Helwan	106·5	55	28 30	?S	(28 30)	+93	—	—
Manila	145·5	314	e 19 50	[+ 1]	—	—	—	—

Additional records: Vieques gives ePE = 4m.58s. Washington gives P as S and S as L. Georgetown eLN? = +12·7m., LN = +16·6m. Ithaca LN = +19·2m. Toronto LE = +19·2m. Harvard iS? = +8m.28s., LE = +23·0, T₀? = 21h.56m.51s. Very uncertain. Victoria L = +31·3m.

June 22d. Records also at 0h. (San Fernando), 2h. and 5h. (Rocca di Papa), 10h. (Manila), 13h. (Cipolletti), 14h. (Athens and La Paz), 17h. (Tokyo), 18h. (Helwan).

June 23d. Records at 0h. (Manila), 1h. (Taihoku and San Fernando), 4h. (Athens (2)), 5h. (La Paz), 6h. (Athens), 14h. (La Paz), 15h. (Rocca di Papa), 23h. (Manila).

June 24d. 1h. 57m. 28s. Epicentre $42^{\circ}3'N$. $17^{\circ}8'E$.

$$A = +.704, B = +.226, C = +.673.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
		m. s.	s.	m. s.	s.	m.	m.
Monte Cassino	2.8	0 50	+ 6	—	—	—	—
Pompeii	2.9	0 45	0	1 20	0	—	—
Rocca di Papa	3.8	1 3	+ 4	—	—	—	2.1
Zagreb	4.0	1 1 46	?S	(1 1 46)	- 4	(2.5)	2.8

Additional record : Zagreb gives $e = +1m.42s$. Also L is recorded as S.

1918. June 24d. 14h. 46m. 40s. Epicentre $1^{\circ}2'S$. $149^{\circ}5'E$.

$$A = -.862, B = +.508, C = -.021; \quad D = +.508, E = +.862; \\ G = +.011, H = -.018, K = -1.000.$$

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Manila	W.	32.4	302	7 32	+40	12 30	+16	16.0	16.7
Riverview	—	32.7	178	e 7 14	-20	e 11 2	-77	e 13.3	16.9
Sydney	M.	32.7	178	11 8	?S	(11 8)	-71	15.0	17.1
Melbourne	M.	36.8	188	13 8	?S	(13 8)	-13	19.1	21.0
Taihoku	O.	37.7	318	—	—	—	—	e 14.0	—
Osaka	O.	38.2	342	—	—	10 1	?PR	—	20.0
Honolulu	M.	55.9	63	9 38	- 7	17 20	-13	24.8	27.3
Victoria	M.	89.1	41	42 50	?L	46 17	?L	52.2	57.6
Helwan	M.	114.8	303	21 20	?PR	—	—	—	—
Graz	W.	119.2	327	—	—	—	—	e 62.3	—
Toronto	M.	119.3	38	—	—	—	—	63.5?	75.8
Zagreb	W.	120.3	325	—	—	e 31 20	+149	61.3	—
Ottawa	—	120.6	34	—	—	—	—	i 55.2?	—
De Bilt	N.	121.0	335	—	—	—	—	e 61.3	66.2
	E.	121.0	335	—	—	—	—	e 62.3	65.6
Edinburgh	M.	121.0	344	46 20	?L	—	—	(46.3)	—
Eskdalemuir	G.	121.5	343	—	—	e 28 31	-30	57.3	—
Stonyhurst	M.	122.4	340	—	—	—	—	—	78.3
Bidston	M.S.	123.0	340	29 20	?S	(29 20)	+ 8	(36.3)	76.6
Paris	—	124.5	334	—	—	—	—	e 64.3	78.3
Shide	—	124.6	339	—	—	—	—	e 64.6	—
Coimbra	—	136.1	337	—	—	—	—	e 73.6	—
La Paz	Bi.	138.9	116	19 50	-12	—	—	61.7	—

Additional records : Manila gives $MN = +16.3m$. Riverview $PS = +11m.35s.$, $MZ = +17.1m.$, $T_0 = 14h.49m.6s$. Melbourne $S = +17m.8s.$, $SR_1 = +17m.56s$. Honolulu $T_0 = 14h.46m.42s$. Toronto $LE = +71.4m$. Ottawa $eL = +59.3m$. Bidston gives S as P and L as S.

The above is about the best compromise solution that can be obtained from rather refractory data. But the La Paz residual (+12s.) suggests a "high focus." If we suppose a focus 0.020 above the normal and transfer the epicentre to $1^{\circ}S$. $154^{\circ}E$. (as on 1914 May 18-19), the chief observations near the epicentre would be as follows :—

$$A = -.899, B = +.438, C = -.017.$$

		Corr. for Focus.	P.	O-C.	S.	O-C.
			m. s.	s.	m. s.	s.
Riverview	32.9	+1.5	7 14	+ 6	11 2	-104
Sydney	32.9	-1.5	11 8	?S	(11 8)	- 98
Manila	36.3	+1.6	7 32	- 5	12 30	- 67
Melbourne	37.8	+1.6	13 8	?S	(13 8)	- 49
Osaka	39.8	+1.7	10 1	+114	—	—
Honolulu	51.9	+2.2	9 38	- 4	17 20	+ 10

The Osaka observation may be 2min. in error, but the discordances in S for the first four stations probably represent something real, perhaps another shock from another focus.

June 24d. Records also at 0h. (San Fernando), 2h. (Osaka, Tokyo, and Manila), 3h. (Manila), 8h. (Taihoku), 13h. (San Fernando), 14h. (La Paz), 21h. (Tortosa).

June 25d. Records at 0h. (San Fernando), 3h. (Monte Cassino), 6h. (Helwan and La Paz), 10h. (Helwan), 12h. (La Paz), 19h. (Zi-ka-wei (2) and Taihoku), 21h. (La Paz).

June 26d. 13h. 46m. 3s. Epicentre $35^{\circ}0'N$, $139^{\circ}5'E$.

A = -0.623, B = -0.532, C = +0.574; D = +0.649, E = +0.760;
G = -0.436, H = +0.372, K = -0.819.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo		0.7	16	0 14	+ 3	0 23	+ 3	—	—
Osaka		3.4	266	0 54	+ 1	—	—	1.7	3.2
Kobe		3.6	266	0 56	0	—	—	1.8	2.2
Mizusawa	E.	4.3	17	1 7	0	1 58	0	—	—
	N.	4.3	17	1 6	- 1	1 57	- 1	—	—
Zi-ka-wei		15.6	261	3 43	- 4	7 51	?L	9.0	10.0
Melbourne		73.0	176	—	—	—	—	—	50.2
Edinburgh		83.7	340	45 57	?L	—	—	(46.0)	—
Graz		83.7	325	e 12 35	- 5	—	—	—	—
De Bilt	N.	84.2	334	—	—	—	—	e 46.0	53.4
	E.	84.2	334	—	—	—	—	e 47.0	50.1
Zagreb		84.5	324	e 12 32	-13	—	—	48.0	—
Stonyhurst		85.3	339	—	—	—	—	—	53.0
Bidston		85.8	339	40 27	?L	—	—	(40.4)	46.0
Helwan		86.4	304	22 57	?S	(22 57)	-37	—	—
Paris		87.9	333	—	—	—	—	54.0	56.0
Moncalieri		88.9	328	e 47 27	?L	50 53?	?	55.4	—
Rocca di Papa		89.1	323	i 16 28	?PR ₁	—	—	58.4	59.6
La Paz		149.2	60	i 20 9	[+15]	—	—	—	—

Additional records: Osaka gives MN = -2.4m. Kobe MN = +2.0m.
Zi-ka-wei SR₁E = +8m.31s. Melbourne iM = +72.4m. Rocca di Papa
M = +16.6m.

June 26d. 21h. 29m. 50s. Epicentre $16^{\circ}0'S$, $168^{\circ}0'E$. (as on 1917 May 29d. and 1917 Nov. 29).

A = -0.940, B = +0.200, C = -0.276; D = +0.208, E = +0.978;
G = +0.636, H = -0.159, K = -0.755.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia		19.7	86	e 4 40	- 3	—	—	8.2	11.6
Riverview		23.4	217	5 28	+ 7	e 9 34	+ 1	e 12.2	14.6
Sydney		23.4	217	5 22	+ 1	9 52	+19	12.7	13.5
Melbourne		29.8	219	—	—	12 28	+57	19.3	19.8
Adelaide		32.4	230	11 58	?S	(11 58)	-16	—	19.9
Honolulu		50.1	43	16 16	?S	(16 16)	- 4	22.4	23.9
Osaka		59.4	329	10 4	- 4	—	—	—	29.3
Victoria		88.5	38	—	—	—	—	40.7	51.1
Kodaikanal		93.4	279	61 10?	?L	—	—	(61.2?)	—
La Paz		115.8	118	72 22	?L	—	—	(72.4)	—
Toronto		117.2	19	—	—	—	—	62.3	69.5
Ottawa		119.7	45	—	—	—	—	e 59.2	—
Helwan		138.0	298	28 10	?S	(28 10)	-162	—	—
De Bilt	E.	141.4	343	e 20 40	[+58]	—	—	e 74.2	78.4
	N.	141.4	343	—	—	—	—	e 75.2	77.6
Bidston		142.0	351	73 4	?L	76 34	?L	(73.1)	82.6
Zagreb		142.1	330	e 22 10	?PR ₁	—	—	—	—
Rocca di Papa		146.7	328	19 38	[-13]	—	—	—	19.8

Additional records: Riverview gives i = +6m.21s., PS = +9m.57s., i = +11m.32s., MN = +13.2m. Melbourne SR₂ = +16m.34s. Ottawa L = +64.2m. and +68.2m.

June 26d. Records also at 0h. (Tokyo), 5h. (La Paz and Batavia), 12h. (Athens (2)), 14h. (Tokyo), 15h. (Zi-ka-wei), 19h. (Tokyo), 21h. (San Fernando), 23h. (Harvard and Stonyhurst).

June 27d. 21h. 29m. 30s. Epicentre $53^{\circ}5'N$, $159^{\circ}0'W$. (as on 1917 June 4d. and July 25d.).

$$A = -.555, B = -.213, C = +.804; \quad D = -.358, E = +.934; \\ G = -.751, H = -.288, K = -.595.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Victoria	22.8	89	10 58	?L	—	—	(11.0)	22.9
Honolulu	32.2	177	6 48	— 2	—	—	13.1	16.5
Toronto	50.7	67	—	—	—	—	31.8	37.9
Harvard	56.1	63	—	—	—	—	31.4?	—
Edinburgh	68.8	14	20 0	?S	(20 0)	-12	—	50.8
Eskdalemuir	69.3	14	—	—	e 20 37	+19	42.5	—
Bidston	71.2	15	20 36	?S	(20 36)	-4	—	35.5
Kew	73.5	14	—	—	—	—	—	50.5
De Bilt	73.6	10	—	—	21 23	+14	39.5	41.4
Shide	74.1	15	—	—	i 21 29	+14	48.0	50.7
Paris	76.5	12	—	—	e 19 30	-133	45.5	54.5
Graz	79.3	3	e 12 9	- 6	22 36	+21	—	—
Zagreb	80.6	3	e 12 14	- 9	e 22 30	0	48.5	—
Moncalieri	80.8	9	e 23 2	?S	(e 23 2)	+29	47.9	—
Coimbra	82.9	22	—	—	—	—	e 44.0	—
Tortosa	83.9	16	12 37	- 4	23 5	- 3	—	57.2
Rocca di Papa	84.4	6	12 34	-10	—	—	—	12.9
Rio Tinto	85.6	21	32 0	?L	—	—	(32.0)	54.5
San Fernando	87.0	22	41 30	?L	53 0	?	(41.5)	59.5
Helwan	96.0	351	43 30	?L	—	—	(43.5)	—
La Paz	103.7	99	—	—	—	—	75.5	—

Additional records: Toronto gives $L = +36.2m$. Harvard $L? = +32.3m$.
 $LE = +37.0m$, $L = +42.8m$. Stonyhurst $\Delta = 70^{\circ}9'$, gives "Tremors from
 20h.50m. to 21h.40m." De Bilt $LN = +41.5m$. Moncalieri $S? = +35m.37s$.
 San Fernando $L = +56.5m$, $MN = +58.0m$.

June 27d. Records also at 3h. (La Paz), 4h. (De Bilt and Helwan), 5h. (La Paz), 6h. (Rocca di Papa), 11h. and 12h. (La Paz), 14h. (Pola), 16h. (Melbourne).

June 28d. Records at 0h. (San Fernando), 7h. (La Paz), 8h. (La Paz, Balboa Heights, and Helwan), 9h. (Tacubaya), 12h. (La Paz and Apia), 14h. (Riverview).

June 29d. 4h. 12m. 30s. Epicentre $7^{\circ}0'N$, $137^{\circ}0'E$.

$$A = -.726, B = +.677, C = +.122; \quad D = +.682, E = +.731; \\ G = -.089, H = +.083, K = -.993.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Batavia	32.9	247	—	—	—	e 18.5	22.5	—
Riverview	43.0	163	e 8 18?	0	e 14 48	0	e 36.1	40.2
Sydney	43.0	163	—	—	—	—	—	39.3
Melbourne	45.4	171	—	—	—	—	37.3	38.6
Colombo	56.7	274	39 0	?L	—	—	(39.0)	41.0
Helwan	99.9	302	30 30	?	—	—	—	—
De Bilt	N. 108.1	331	—	—	—	—	77.5	81.8
	E. 108.1	331	—	—	—	—	78.5	79.6
Eskdalemuir	109.5	337	—	—	—	—	70.5	—
Bidston	110.9	336	59 48	?L	70 48	?	(59.8)	84.3

Riverview gives $MN_1 = +39.3m$. Sydney gives $P = 4h.6m.0s$. This determination depends entirely on the Riverview observations and the L given by Batavia. Even if these are correct the epicentre may therefore lie anywhere on an arc of a circle drawn with Riverview as centre, and distant between 30° and 40° from Batavia, but the whole uncertainty is greater still.

June 29d. 11h. 2m. 0s. (I) } Epicentre $42^{\circ}3'N$. $17^{\circ}8'E$. (as on 1918 June
12h. 51m. 10s. (II) } 24d. 1h.).

$$A = +.704, B = +.226, C = +.673.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
I Pompeii	2.9	e 2 28	?L	—	—	(e 2.5)	—
II	2.9	e 2 14	?L	—	—	(e 2.2)	—
I Pola	3.8	1 49	?S	(1 49)	+ 5	2.0	2.1
I Rocca di Papa	3.8	i 1 29	?S	(i 1 29)	-15	—	2.8
II	3.8	e 0 56	- 3	1 56	+12	—	2.9
I Zagreb	N.E. 4.0	i 1 5	+ 3	i 1 54	+ 4	—	2.0
I	N.W. 4.0	0 59	- 3	i 1 43	- 7	—	1.9
II	4.0	i 0 59	- 3	i 1 56	+ 6	—	—
I Zurich	8.3	e 2 5	- 1	3 19?	-26	—	—

Zagreb I gives another $M = +1.9m.$, II $i = +1m.6s.$

June 29d. 16h. 15m. Epicentre near Berkeley and Lick. A very slight shock not recorded elsewhere.

		eP. s.	eL s.	M. s.
Berkeley	N.	51	69	72
	E.	52	67	72
Lick	N.	41	50	63
	E.	41	50	66
	V.	40	49	56

June 29d. Records also at 0h. (Tokyo), 1h. (Manila), 2h. (La Paz), 6h. (Stonyhurst), 7h. (La Paz), 8h. (Manila), 14h. (San Fernando), 20h. (Stonyhurst), 21h. (Mizusawa and Tokyo), 22h. (Tokyo).

June 30d. Records at 4h. and 5h. (Batavia), 6h. (Melbourne), 8h. (Manila), 16h. (La Paz), 19h. (San Fernando), 22h. (Tokyo).

TABLE.

Dec. grees.	P sec.	S sec.	S - P sec.	Dec. grees.	P sec.	S sec.	S - P sec.	Dec. grees.	P sec.	S sec.	S - P sec.
1	15	28	13	51	553	991	438	101	855	1565	710
2	31	55	24	52	560	1004	444	102	860	1575	715
3	47	83	36	53	566	1016	450	103	865	1584	719
4	62	110	48	54	573	1029	456	104	870	1593	723
5	77	137	60	55	579	1041	462	105	874	1602	728
6	92	164	72	56	586	1054	468	106	879	1612	733
7	106	190	84	57	592	1066	474	107	884	1621	737
8	121	217	96	58	599	1079	480	108	888	1630	742
9	136	243	107	59	605	1091	486	109	893	1639	746
10	150	269	119	60	612	1103	491	110	897	1648	751
11	164	294	130	61	619	1116	497	111	902	1657	755
12	179	319	140	62	625	1128	503	112	907	1666	759
13	193	344	151	63	632	1141	509	113	911	1674	763
14	206	368	162	64	638	1153	515	114	916	1682	766
15	219	392	173	65	645	1165	520	115	920	1690	770
16	232	415	183	66	651	1177	526	116	925	1698	773
17	245	438	193	67	658	1190	532	117	929	1706	777
18	257	460	203	68	664	1202	538	118	934	1714	780
19	269	482	213	69	671	1214	543	119	938	1722	784
20	281	503	222	70	677	1226	549	120	942	1729	787
21	293	524	231	71	683	1238	555	121	947	1737	790
22	305	545	240	72	690	1250	560	122	952	1744	792
23	317	565	248	73	696	1262	566	123	957	1752	795
24	328	584	256	74	702	1274	572	124	961	1759	798
25	338	603	265	75	709	1286	577	125	966	1766	800
26	348	622	274	76	715	1297	582	126	970	1773	803
27	358	641	283	77	721	1309	588	127	974	1780	806
28	368	659	291	78	727	1320	593	128	978	1787	809
29	378	677	299	79	733	1332	599	129	983	1794	811
30	388	694	306	80	739	1343	604	130	988	1801	813
31	398	711	313	81	745	1355	610	131	992	1807	815
32	407	728	321	82	750	1366	616	132	996	1814	818
33	416	744	328	83	756	1377	621	133	1001	1821	820
34	425	760	335	84	762	1388	626	134	1005	1827	822
35	433	775	342	85	768	1399	631	135	1009	1833	824
36	442	790	348	86	773	1410	637	136	1014	1840	826
37	450	804	354	87	779	1421	642	137	1018	1846	828
38	458	818	360	88	785	1432	647	138	1023	1852	829
39	466	832	366	89	790	1443	653	139	1027	1858	831
40	475	847	372	90	796	1454	658	140	1031	1864	833
41	483	861	378	91	801	1464	663	141	1035	1869	834
42	491	875	384	92	807	1475	668	142	1039	1875	836
43	498	888	390	93	812	1485	673	143	1043	1881	838
44	506	902	396	94	818	1496	678	144	1047	1886	839
45	513	915	402	95	823	1506	683	145	1051	1892	841
46	520	928	408	96	829	1516	687	146	1055	1897	842
47	527	941	414	97	834	1526	692	147	1059	1902	843
48	534	954	420	98	840	1536	696	148	1063	1907	844
49	540	966	426	99	845	1546	701	149	1067	1912	845
50	547	979	432	100	851	1556	705	150	1071	1917	846

The International Seismological Summary for 1918 (Continued).

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number contains the information for July, August, and September, 1918. The practice of presenting three months' records at a time is found to be convenient.

Special attention has been paid to the series of shocks from the Epicentre $46^{\circ}5N$. $151^{\circ}4E$. For the first of these (on Sept. 7d. 17h.) the focus was apparently 0.030 radius *above* the usual depth, while for that on Sept. 8d. 5h. it seems to be at normal depth. The essential difference between the two cases is shown by a direct comparison in a note to Sept. 8d. 5h. The repetition on Sept. 8d. 0h., however, seems to agree with Sept. 7d. 17h. For the other repetitions the evidence is generally too slight to decide whether the focus is high or normal, though on Sept. 12d. 13h. there seems to be a return to the high focus of Sept. 7d. 17h. [Another instance of the occurrence of shocks at different depths below the same Epicentre seems to be furnished by the shocks of 1918 Feb. 7d. 5h. and 1918 Sept. 11d. 4h., the latter having normal depth, the former 0.025 below.]

But the series has another point of interest. It is shown that the periodicity of 21min. suggested in another connection has no appreciable influence in determining the sequence. But the suggestion of Dr. Jeans (Proc.R.S. A. Vol. 102, p. 554, 1923) that the shocks recur after times $mt_1 + nt_2$ where $t_1 = 125.8\text{min.}$ and $t_2 = 222.0\text{min.}$ was found to be borne out with striking accuracy on one condition, viz., that for the time of the first shock (Sept. 7d. 17h.) the value of m is at least $+2$. Otherwise (*i.e.*, if m and n are zero for the first shock) the first two repetitions cannot be represented with positive values of m and n ; though from the third shock onwards this can be done. The representation is, however, so satisfactory if this condition be granted as to support Dr. Jean's suggestion very strongly.

H. H. TURNER.

University Observatory, Oxford,
1923 August 8th.

1918 JULY, AUGUST & SEPTEMBER.

1918. July 1d. 6h. 8m. 18s. Epicentre 9°·5N. 127°·0E.

A = -·594, B = +·788, C = +·165 ; D = +·799, E = +·602 ;
G = -·099, H = +·132, K = -·986.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Manila	W.	7·8	311	i 2 6	+ 8			4·0	4·2
Taiheku	O.	16·4	342	4 17	+20			7·5	10·5
Zi-ka-wei		22·3	347	i 5 14	+ 5	9 20	+ 9	i 9·7	15·9
Batavia	W.	25·5	233	5 33	-10	10 2	-11	—	12·7
Kobe	O.	26·2	15	e 5 56	+ 6	(10 25)	- 1	10·4	16·2
Osaka	O.	26·4	16	5 57	+ 5	(10 37)	+ 7	10·6	20·2
Mizusawa	E.	32·2	21	6 48	- 2	11 57	-14	—	—
Adelaide	M.	45·8	167	12 59	?	(14 59)	-26	24·0	26·4
Colombo	M.	46·8	271	6 18	?	15 36	- 2	28·4	33·4
Kodaikanal	M.	48·8	275	9 24	+25	—	—	20·2	36·1
Riverview	—	49·0	153	e 9 0	0	e 15 54	-12	e 24·5	26·7
Sydney		49·0	153	9 6	+ 6	(16 18)	+12	26·2	31·9
Melbourne	M.	50·2	161	—	—	(16 36)	+15	30·6	32·7
Simla	O.E.	51·0	303	9 0	-13	—	—	—	26·4
Bombay	O.E.	53·2	287	8 51	-36	—	—	—	—
Honolulu	M.	72·7	70	10 54	-40	21 0	+ 2	33·6	35·7
Mauritius	N.	M.	74·1	246	18 54	?	—	—	31·1
	E.	M.	74·1	246	19 48	?	—	38·7	41·2
Helwan	M.	90·2	300	13 36	+19	—	—	—	64·8
Lemberg	B.O.	91·0	321	e 19 48	?	e 23 54?	-30	e 55·7	60·3
Budapest		94·8	320	—	—	e 24 42	-22	—	—
Victoria	M.	95·6	39	23 42	? S	31 34	? SR ₁	45·3	75·4
Vienna	Z.	96·3	321	i 13 43	- 8	—	—	—	—
Graz	W.	97·2	320	12 42	-73	—	—	—	—
Zagreb	W.	97·4	319	e 12 41	-75	e 24 17	-73	50·7	59·7
Triest	W.	98·9	319	e 15 6?	+61	—	—	—	—
Pola	W.	99·1	318	e 24 39	? S	(e 24 39)	-68	e 55·2	63·8
Berkeley		100·0	49	e 34 12	? SR ₁	—	—	—	—
Pompeii		100·3	315	e 18 24	? PR ₁	e 24 14	-105	—	—
Rocca di Papa	Ag.	100·8	316	e 18 6	? PR ₁	—	—	e 51·1	68·8
De Bilt	N.	101·0	328	—	—	—	—	e 54·7	57·4
	E.	101·0	328	—	—	e 24 6	-119	e 56·7	61·5
Uccle		102·1	327	—	—	—	—	e 53·7	56·7
Edinburgh	M.	102·8	334	e 17 42	? PR ₁	—	—	—	67·2
Moncalieri	S.	103·0	321	e 14 15?	-10	26 7	17	43·1	69·0
Eskdalemuir	G.	103·2	333	e 14 12	-14	i 24 57	-89	46·7	57·0
Stonyhurst	M.	103·7	332	19 42	? PR ₁	29 12	?	58·7	64·0
Kew	M.	104·1	329	—	—	—	—	—	67·7
Bidston	M.S.	104·2	332	17 42	? PR ₁	25 6	-89	—	36·8
Paris		104·2	326	e 18 42	? PR ₁	e 24 58	-97	53·7	57·7
Barcelona	Ma.	108·2	320	—	—	e 24 22	-170	e 57·2	67·7
Tortosa		109·7	320	19 12	? PR ₁	25 22	-123	28·7	68·0
Cape Town	M.	110·7	237	55 12	? L	—	—	(55·2)	69·2
Coimbra		115·6	324	e 19 59	? PR ₁	29 36	+81	57·6	63·6
Rio Tinto	M.	115·9	320	19 42	? PR ₁	—	—	(56·7)	81·0
Ottawa		121·4	19	i 20 42	? PR ₁	30 36	+96	e 60·7?	—
Toronto	M.	121·7	22	—	—	—	—	54·5	—
Accra	M.	125·3	284	—	—	—	—	76·2	89·7
Georgetown		126·7	23	e 21 19	? PR ₁	—	—	76·7	—
Washington	Mar.	126·7	23	21 24?	? PR ₁	27 22?	?	58·7	81·2
La Paz	Bi.	163·7	117	20 18	[?]	33 56	?	75·7	83·7

For Notes see next page.

NOTES TO JULY 1d. 6h. 8m. 18s.

Additional records: Manila gives MN = +4.5m. Zi-ka-wei MN = +17.3m.
 Batavia gives its records ten minutes early. Kobe MN = +16.1m.
 Osaka MN = +15.9m. Mizusawa SN = +12m.6s. Adelaide S is given
 as PR₁, also S = +18m.19s., SR₁ = +20m.4s. Riverview ePR₁ = +11m.7s.,
 eS = +16m.1s., PS = +16m.25s., MN = +25.5m., MZ = +37.3m., T₀ =
 6h.8m.36s. Sydney gives S +10m. wrong. Melbourne S is given as
 PR₁, also S = +22m.6s., SR₁ = +25m.42s., SR₂ = +27m.12s. Simla
 MN = +31.4m. Zagreb MNW = +63.7m. Pola MN = +65.9m. Rocca
 di Papa L = +60.1m., +61.1m., and +78.4m. De Bilt gives epicentre
 9° 0'N. 127° 0'E. Moncalieri MN = +71.6m. Eskdalemuir e = +18m.26s.
 Coimbra MN = +63.3m. Rio Tinto M = +28.7m. Ottawa L = +76.7m.
 and +88.7m. Toronto L = +69.0m. and +89.9m. Washington L =
 +34.2m. and +76.7m.

July 1d. 11h. 2m. 0s. Epicentre 34° 5'N. 25° 0'E.

A = +.747, B = +.348, C = +.566; D = +.423, E = -.906;
 G = +.513, H = +.239, K = -.824.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3.6	344	0 59	+ 3	1 41	+ 2	2.0	2.2
Pompeii	10.3	310	i 2 44	+10	e 4 38	+ 1	6.5	—
Rocca di Papa	12.1	310	e 3 12	+12	—	—	—	3.8
Zagreb	13.2	331	e 3 15	- 1	e 7 37?	?L	(e 7.6?)	8.5
Pola	13.4	324	—	—	e 5 59	+ 6	e 8.2	8.9
Triest	14.1	326	e 6 0	?S	(e 6 0)	-10	—	—
Graz	14.5	333	e 3 33	0	5 48	-32	—	—
Lemberg	15.4	359	e 6 33	?S	(e 6 33)	- 8	e 8.2	9.4
Moncalieri	16.9	314	—	—	e 7 33	+17	10.2	12.2
Paris	21.9	318	—	—	i 9 13	+10	13.0	—
Uccle	22.1	324	e 5 0	- 6	e 8 12	-55	e 12.0	—
De Bilt	N. 22.6	327	—	—	e 9 15	- 2	11.5	13.1
E. 22.6	327	—	—	—	—	—	12.7	15.5
Bidston	27.4	322	13 42	?L	—	—	(13.7)	17.4
Edinburgh	28.8	327	16 20	?L	—	—	(16.3)	—

Additional records: Athens gives MN = +2.3m. Zagreb e = +4m.15s.,
 MNW = +8.7m.

July 1d. Records also at 5h. (Rio Tinto (2)), 8h. (Rio Tinto and Mizusawa),
 10h. (Tokyo), 21h. (Lick).

July 2d. Records at 1h. (San Fernando), 3h. (Batavia), 4h. (Ootomari), 6h. (La
 Paz), 7h. (Melbourne), 8h. (La Paz and Helwan), 11h. (Helwan and Ann
 Arbor), 14h. (Taihoku and Rio Tinto), 15h. (Pompeii), 17h. (Manila (2)),
 19h. (Manila), 20h. (Taihoku), 23h. (Taihoku, Manila, and San
 Fernando).

1918. July 3d. 6h. 51m. 55s. Epicentre 3°5S. 142°0E.

A = -·787, B = +·615, C = -·061; D = +·616, E = +·788;

G = +·048, H = -·038, K = -·998.

The deduced values of T_0 have rather a wide range. The adopted value is near the mean, and the anticeutral stations suggest a normal focal depth. But the observations in Japan and Australia (roughly N. and S.) are both negative, as for a deep focus. The Indian and Apia observations would be improved a little by an epicentre further east.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Manila	W.	27·7	312	e 6 5	0	i 10 29	-25	i 12·5	14·3
Riverview		31·5	165	i 6 30	-13	e 11 48	-12	e 13·9	19·3
Sydney	M.	31·5	165	6 35	-8	11 35	-25	14·4	18·9
Adelaide	M.	31·6	185	6 43	0	11 55	-6	15·8	18·3
Melbourne	M.	34·4	176	9 11	? PR ₁	14 35	? SR ₁	18·1	20·1
Taihoku	O.	34·9	326	7 6	-6	12 40	-14	15·8	20·4
Batavia	W.	35·2	264	i 7 16	+1	i 8 53	? PR ₁	—	18·1
Perth	M.	37·6	218	6 56	-39	—	—	—	—
Kobe	O.	38·7	351	e 7 34	-10	—	—	16·4	16·7
Osaka	O.	38·7	351	7 36	-8	12 39	-69	15·8	16·2
Tokyo	O.	39·2	357	7 45	-3	18 6	? L.	(18·1)	—
Zi-ka-Wei	N.	39·9	332	7 52	-2	e 13 50	-15	e 16·7	22·7
	E.	39·9	332	—	—	e 13 56	-9	e 17·0	22·5
Mizusawa	O.	42·6	359	8 7	-8	14 2	-41	—	—
	N.	42·6	359	8 3	-12	14 12	-31	—	—
Apia	W.	46·8	106	e 8 25	-21	e 14 45	-53	18·6	28·6
Ootomari		50·2	1	8 58	-10	16 22	+2	20·1	21·9
Calcutta	O.E.	58·5	299	10 5	+3	18 29	+24	—	—
Colombo	M.	62·9	280	10 23	-8	15 5	? PR ₁	23·1	38·1
Honolulu	M.	63·7	64	10 35	-1	19 17	+8	31·5	34·2
Kodaikanal	M.	65·8	283	10 53	+3	—	—	16·1	45·8
Simla	O.E.	70·6	305	e 11 5	-16	e 20 23	-10	—	45·1
Bombay	O.E.	71·6	291	11 30	+3	21 3	+18	—	45·4
Sitka	E.	B.O.	89·0	33	—	23 32	-31	—	23·9
	N.	B.O.	89·0	33	—	23 38	-25	—	37·4
Victoria	M.	95·8	42	13 43	-5	i 25 33	+19	44·4	55·9
	Z.	95·8	42	13 35	-13	—	—	44·1	52·7
Berkeley		96·6	52	e 17 24	? PR ₁	e 26 9	+47	—	48·6
Lick	W.	97·2	53	e 18 5	? PR ₁	—	—	—	—
Tucson	B.O.	106·4	57	23 54	?	—	—	47·1	67·1
Lemberg	B.O.	110·4	323	e 19 17	? PR ₁	e 28 17	+45	e 57·1	68·3
Athens	E.	—	114·2	310	19 50	? PR ₁	e 29 43	-99	e 58·1
	N.	—	114·2	310	19 57	? PR ₁	—	—	73·6
Budapest		—	114·4	322	19 38	? PR ₁	24 38	?	—
Cape Town	M.	115·0	230	24 47	?	29 35	+85	59·0	66·6
Vienna		115·6	323	19 53	? PR ₁	—	—	—	—
Graz	W.	116·7	322	e 19 33	? PR ₁	—	—	—	—
Zagreb	W.	117·0	321	e 15 14	-15	—	—	60·1	74·1
Triest	W.	118·4	321	19 57	? PR ₁	28 27	-10	—	—
Pola	W.	118·7	320	e 20 7	? PR ₁	e 30 13	+93	e 44·6	74·1
Dyce	Ma.	119·2	339	19 39	? PR ₁	30 53	+127	49·6	66·9
Hohenheim		119·5	326	e 18 59	-8	30 15	-89	—	—
De Bilt	E.	119·8	331	15 35	-6	e 28 33	-15	59·1	56·5
	N.	119·8	331	—	—	e 28 22	-26	53·1	60·4
Pompeii	O.A.	120·0	316	i 19 49	? PR ₁	i 29 59	-70	58·5	64·5
Monte Cassino		120·2	317	41 46	? L.	—	—	(41·8)	41·8
Edinburgh	M.	120·6	338	19 5	-11	—	—	—	76·1
Zurich		120·6	325	e 19 3	-9	e 20 36?	? PR ₁	—	—
Rocca di Papa	Ag.	120·8	318	e 19 1	-7	26 15?	?	e 59·4	73·8
Uccle		120·8	330	e 18 59	-5	e 30 17	+82	50·1	63·8
Eskdalemuir	G.	121·1	338	e 15 33	-15	i 28 38	-20	38·1	44·7
St. Louis	W.	121·1	46	—	—	e 28 5	-53	58·1	63·1
Milan		121·3	323	21 14	? PR ₁	—	—	—	25·0
Stonyhurst	M.	121·9	336	21 35	? PR ₁	29 41	+38	—	72·0
Besamcon		122·1	326	—	—	—	—	58 1	—
Badston	M.S.	122·4	336	16 5	-11	19 59	? PR ₁	—	74·2

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O—C.	S.	O—C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
Moncalieri	S.	122.5	323	15 45	-10	28 23	-45	37.8	76.6
Kew	M.	122.6	333	20 5	? PR ₁	—	—	—	76.1
Paris	—	123.0	329	120 52	? PR ₁	e 28 49	-23	51.1	63.1
Slide	—	123.6	333	20 34	? PR ₁	—	—	51.2	77.2
Ann Arbor	E. W.	123.8	40	19 11	[+ 8]	—	—	59.0	—
	E. B.	123.8	40	18 35	[-28]	30 47	+89	60.1	64.1
	N. B.	123.8	40	19 17	[+14]	29 5?	-13	58.1	—
Marseilles	Ma.	124.7	323	e 21 1?	? PR ₁	—	—	65.1	78.1
Toronto	M.	125.8	36	22 35?	?	29 59	+27	i 66.6	72.4
Ottawa	—	126.7	32	i 21 5	? PR ₁	e 28 5	-93	61.1	—
Barcelona	—	127.8	322	e 19 49	? PR ₁	—	—	e 59.9	63.2
Ithaca	E. B.O.	128.1	36	e 21 21	? PR ₁	e 31 21	+93	e 56.9	—
	N. B.O.	128.1	36	22 41	?	e 33 3	+195	e 57.6	—
Tortosa	—	129.1	323	19 20	[+ 4]	32 35	+160	39.7	82.0
Northfield	B.O.	129.3	32	18 25	?	25 50	?	e 56.1	—
Cipolletti	M.	129.4	150	26 41	—	—	—	77.6	94.4
Algiers	B.M.	129.7	317	e 19 32	[+15]	30 12	+13	48.1	68.1
Georgetown	E. —	129.9	40	e 19 18	0	31 33	+93	e 51.2	—
	N. —	129.9	40	e 19 15	[- 3]	31 35	+95	e 51.2	—
Washington	Mar.	129.9	40	19 15	[- 3]	26 25	?	66.1	—
Cheltenham	N. B.O.	130.1	40	21 36	? PR ₁	38 26	? SR ₁	63.8	74.4
	E. B.O.	130.1	40	21 35	? PR ₁	38 35	? SR ₁	64.3	87.7
Harvard	E. B.O.	131.3	32	(21 36)	? PR ₁	31 37	+28	—	—
	N. B.O.	131.3	32	(22 31)	? PR ₁	31 25	+16	67.4	71.7
Coimbra	—	134.6	328	18 59	[-30]	31 29?	+58	59.9	73.7
	E. —	134.6	328	19 37	[+ 8]	31 9?	+38	64.6	70.4
San Fernando	—	135.9	322	18 5	+71	—	—	73.1	86.1
Pilar	M.	137.2	147	20 53	[+79]	—	—	81.6	96.6
Chacarita	M.	137.3	155	24 23	? PR ₁	—	—	78.9	85.4
Andalgala	N. M.	138.7	141	24 53	? PR ₁	—	—	80.9	103.4
	E. M.	138.7	141	24 53	? PR ₁	—	—	74.9	94.2
Accra	M.	142.3	274	32 35	? S	(32 35)	+78	—	46.1
La Quiaca	M.	142.7	135	24 23	? PR ₁	—	—	—	—
La Paz	Bi.	144.1	125	19 50	[+ 3]	33 53	?	69.0	78.8
Vieques	N. B.O.	149.4	59	20 4	[+ 9]	—	—	—	110.1
	E. B.O.	149.4	59	20 26	[+31]	—	—	101.9	110.3
Rio de Janeiro	B.O.	153.1	171	—	—	e 35 5	?	60.3	—

Additional records: Manila gives $T_0 = 6h.52m.28s.$ Riverview $PR_1 = +8m.16s.$, $eS = +11m.37s.$, $MZ = +19.8m.$ Epicentre $4^\circ 0S. 149^\circ 0E.$, $T_0 = 6h.51m.57s.$ Adelaide $PR_1 = +10m.23s.$, $SR_1 = +13m.23s.$ Melbourne $SR_1 = +16m.5s.$, $SR_2 = +16m.35s.$ Kobe $MN = +23.0m.$ Should ME be 10m. later? Osaka $MN = +19.8m.$, $T_0 = 6h.53m.9s.$ Zi-ka-wei $iE = +14m.10s.$, $iN = +14m.28s.$, $iE = +17m.16s.$, $iN = +17m.18s.$ Mizusawa $T_0 = 6h.52m.25s.$ Apia $eP = +8m.35s.$ Colombo $M = +46.2m.$ Honolulu $T_0 = 6h.51m.48s.$ Victoria (horizontal Component) $S?$ = $+16m.59s.$, $S = +23m.53s.$ Berkeley $T_0 = 6h.58m.34s.$ Zagreb $MNW = +64.1m.$ Pola $MN = +73.1m.$ De Bilt $PR_1 = +20m.32s.$, $eE = +30m.18s.$ and $+49m.35s.$, $eN = +49m.47s.$ Epicentre $3^\circ 5S. 144^\circ 5E.$ Uccle $PR_1 = +20m.29s.$, $M = +64.2m.$ Eskdalemuir $i = +20m.37s.$ and $+24m.36s.$, $M = +51.8m.$ St. Louis gives eS as $eLN.$ Moncalieri $MN = +76.2.$ Toronto $P = +24m.59s.$, S or $iL = +33m.47s.$ Ottawa $eE = +30m.59s.$, $e = +33m.17s.$ and several L 's. A confused record, probably of several shocks. Ithaca $eE = +38m.32s.$, $eN = +38m.29s.$ and $+43m.53s.$ Northfield $LE = +65.1m.$, $+69.1m.$, and $+113.1m.$ Georgetown $PR_1E = +21m.43s.$, $PR_1N = +21m.29s.$, $eE = +22m.40s.$, $eN = +22m.47s.$ Washington $L = +49.6m.$, $+56.1m.$, and $+62.1m.$ Harvard $eE = +22m.38s.$, $eN = +32m.37s.$, $eE = +39m.37s.$ Coimbra $PR_1E = +22m.8s.$, $PR_1N = +21m.57s.$, $SR_1 = +40m.9s.$ San Fernando $MN = +88.1m.$ Pilar $MN = +93.9m.$ La Paz $PR_1 = +23m.31s.$, $SR_1 = +36m.11s.$, $SR_2 = +40m.36s.$

July 3d. Records also at 0h. (Lick), 2h. (La Paz), 8h. (Mizusawa and Barcelona), 9h. (Riverview), 14h., 17h., and 19h. (Manila).

July 4d. 11h. 25m. 15s. Epicentre $37^{\circ}4'N$, $30^{\circ}5'E$. (as on 1918 Jan. 16d. 7h.).

$A = +.684$, $B = +.403$, $C = -.607$; $D = +.508$, $E = -.862$;

$G = +.523$, $H = +.308$, $K = -.794$.

The residuals for Triest, Bidston, and Eskdalemuir suggest an earlier shock in addition.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Athens	5.4	278	e 1 31	8	e 2 13	-15	e 2.7	2.8
Helwan	7.6	174	2 45	-50	—	—	—	—
Pompeii	12.8	290	i 3 35	-25	i 7 5	?L	(7.1)	—
Lemberg	13.2	342	—	—	—	—	e 7.2	9.7
Zagreb	13.7	313	e 3 16	-6	—	—	i 7.7	8.9
Rocca di Papa	14.4	293	i 3 41	-9	—	—	e 8.0	9.2
Pola	14.5	306	e 7 21	?S	(e 7 21)	-61	e 8.3	9.4
Graz	14.7	316	e 4 56	-81	—	—	—	—
Vienna	14.9	321	e 5 15	-97	(5 15)	-75	—	—
Triest	15.0	308	e 5 45	+126	—	—	—	—
Moncalieri	18.7	301	4 35	+10	7 49	-6	10.4	13.0
Zurich	18.9	309	4 32	-4	—	—	e 11.7	—
Barcelona	22.2	289	—	—	—	—	—	14.8
Uccle	22.9	314	e 5 9	-7	—	—	e 11.7	—
De Bilt	23.0	318	e 5 15	-2	e 9 23	-2	12.7	15.2
Paris	23.2	308	i 5 17	-2	e 9 30	+1	13.7	14.7
Kew	25.8	313	—	—	—	—	—	10.7
Stonyhurst	27.9	317	—	—	—	—	—	20.0
Bidston	28.1	316	4 27	-102	11 21	+20	—	17.0
Eskdalemuir	28.9	319	4 34	-103	11 25	+10	17.4	—
Edinburgh	29.1	320	10 45?	?S	(10 45)	-34	—	—

Additional records: Zagreb gives $i = -7m.57s.$, and three other records, Pola
 $MN = +9.5m.$ Moncalieri $MN = -13.1m.$ Barcelona gives $e =$
 11h.25m.38s.

July 4d. Records also at 0h. (San Fernando and Zurich), 6h. (La Paz and Zurich), 7h. (Dehra Dun), 14h. (Taihoku, De Bilt, and Paris), 18h. (Taihoku), 23h. (La Paz and Cipolletti).

July 5d. 15h. 41m. 20s. Epicentre $37^{\circ}0'N$, $20^{\circ}5'E$.

$A = +.748$, $B = +.280$, $C = -.602$; $D = +.350$, $E = -.937$;

$G = +.564$, $H = +.211$, $K = -.799$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Athens	2.8	69	0 47	+3	1 23	+6	—	2.0
Pompeii	5.9	311	e 1 45	+14	e 2 47	+6	—	—
Rocca di Papa	7.6	311	e 1 27	-28	—	—	—	2.8
Pola	9.2	330	e 1 40	-39	(e 4 8)	0	e 4.1	4.6
Zagreb	9.4	341	e 1 38	-44	i 2 2	?P	—	4.0
Triest	10.0	332	2 42	+12	—	—	—	—
Graz	10.7	342	e 2 16	-24	—	—	—	—
Helwan	11.6	125	13 40	?L	—	—	(13.7)	—
Vienna	E. 11.6	346	e 2 40	-13	—	—	—	—
Moncalieri	12.4	314	—	—	e 5 28	-1	8.1	—
Lemberg	13.1	10	e 5 34	?S	(e 5 34)	-12	—	5.8
Hohenheim	14.3	329	—	—	e 6 34	+19	—	—
De Bilt	18.5	330	—	—	—	—	e 9.2	—

Additional records: Athens gives $T_0 = 15h.41m.21s.$ Pola $MN = +4.2m.$
 Zagreb $i = +1m.54s.$ and $+3m.36s.$, $MNE = +4.1m.$, $MNW = +4.2m.$

July 5d. Records also at 0h. and 16h. (San Fernando), 20h. (La Paz), 23h. (Manila).

July 6d. 20h. 10m. 22s. Epicentre $8^{\circ}0'S$, $146^{\circ}5'E$.

$A = -.826$, $B = +.547$, $C = -.139$; $D = +.552$, $E = +.834$;

$G = +.116$, $H = -.077$, $K = -.990$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	26.2	171	e 5 50	0	e 10 26	0	16.7	16.7
Melbourne	29.9	183	e 11 38	?S	(e 11 38)	+6	18.2	20.0
Manila	34.0	312	e 8 38	?PR ₁	—	—	—	—
Honolulu	61.8	61	18 38	?S	(18 38)	-8	27.1	30.1
Helwan	115.7	299	73 38	?L	—	—	(73.6)	—
De Bilt	E. 125.8	332	—	—	e 30 47	+75	66.6	67.6
	N. 125.8	332	—	—	e 31 10	+98	65.6	68.5
Eskdalemuir	126.9	339	—	—	—	—	66.6	—
Stonyhurst	127.8	337	e 72 38	?L	e 75 8	?L	(e 72.6)	78.6
Bidston	128.3	337	70 20	?L	—	—	(70.3)	79.1
Paris	129.2	330	—	—	—	—	e 72.6	76.6

Additional records: Riverview gives $PS = +10m.59s.$, $MN = +15.4$ and $T_0 =$
 20h.10m.24s.

July 6d. Records also at 3h. (Tokyo), 5h. (La Paz), 13h. (Barcelona), 14h. (La Paz, Melbourne, and Manila), 15h. (La Paz), 16h. (Zurich and La Paz), 17h. (Rio Tinto).

July 7d. Records at 0h. (La Paz), 4h. (Colombo), 7h. (Lick), 9h. (Taihoku), 10h. (Accra), 12h. (Manila), 13h. (Manila), 16h. (Rio Tinto), 20h. (River-view), 23h. (La Paz).

1918. July 8d. 10h. 22m. 7s. Epicentre 26°·5N. 92°·0E.

A = -·031, B = +·894, C = +·449; D = +·999, E = +·035;

G = -·016, H = +·446, K = -·895.

A better Epicentre would probably be 26°·5N. 90°·4E. See Note at end.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
Calcutta	O.E.	5·2	221	0 53	-27	—	—	—	—
Dehra Dun	O.	12·8	290	1 53	-77	—	—	—	—
Simla	O.E.	13·8	293	2 47	-36	e 5 17	-46	6·7	—
Bombay	O.E.	19·2	251	4 4	-27	7 22	-44	9·2	—
Kodaikanal	M.	21·2	223	—	—	—	—	4·3	9·4
Colombo	M.	22·8	213	(5 23)	+ 8	—	—	5·4	21·1
Hokoto	O.	25·1	91	5 3	-36	(9 38)	-27	9·6	10·4
Zi-ka-wei	—	26·1	73	5 49	0	9 24	-60	—	16·9
Taihoku	O.	26·6	86	5 50	-4	10 43	+10	15·4	17·4
Manila	W.	29·5	108	e 6 9	-14	i 11 32	+ 6	14·7	19·1
Batavia	W.	35·7	154	6 47	-32	—	—	—	15·9
Kobe	O.	37·7	67	7 31	-5	—	—	19·4	23·5
Osaka	O.	38·0	67	7 32	-6	13 35	-3	19·5	24·9
Tokyo	O.	41·4	66	8 1	-5	15 28	+61	22·3	—
Mizusawa	O.	42·6	60	8 13	-2	14 47	+ 4	—	—
	O.	42·6	60	8 14	-1	14 34	-9	—	—
	O.	44·4	49	8 27	-2	15 12	+ 5	18·8	30·2
Ootomari	M.	52·9	289	9 23	-2	—	—	—	35·3
Helwan	B.O.	56·1	314	e 9 50	+ 3	i 17 42	+ 7	e 36·8	37·5
Lemberg	M.	57·6	300	9 53	-3	17 47	-7	27·4	41·6
Athens	—	61·2	313	i 10 20	0	—	—	—	—
Vienna	W.	61·9	310	e 10 24	0	i 18 51	+ 4	36·9	38·9
Zagreb	M.	62·7	157	10 25	-5	18 33	-24	—	—
Perth	W.	63·5	309	e 10 33	-2	i 19 7	0	e 29·4	44·4
Pola	O.A.	64·0	305	i 10 47	+ 9	e 18 11	-62	32·0	45·0
Pompeii	—	64·3	308	10 47	+ 7	—	—	—	11·1
Monte Cassino	Ag.	65·1	306	10 40	-6	19 51	+25	e 34·4	40·1
Rocca di Papa	—	66·5	313	e 10 55	0	19 51	+ 7	—	—
Zurich	—	66·6	311	11 13	+18	—	—	—	21·7
Milan	—	67·5	318	11 6	+ 5	20 3	+ 7	35·9	36·9
De Bilt	S.	67·7	310	i 11 5	+ 3	i 19 54	-4	31·8	44·8
Moncalieri	—	68·3	313	11 25	+19	20 23	+17	36·9	—
Besançon	—	68·3	317	e 11 7	+ 1	20 12	+ 6	27·9	38·1
Uccle	—	69·9	309	i 11 28	+12	i 20 28	+ 3	38·9	44·9
Marseilles	—	70·0	316	i 11 20	+ 3	i 20 23	-3	32·9	38·9
Paris	Ma.	70·1	325	e 11 41	+23	20 45	+18	29·2	36·9
Dyce	Ma.	70·1	325	11 29	+11	20 41	+14	29·3	36·8
Kew	M.	70·9	319	20 53	? S	(20 53)	+16	—	42·9
Edinburgh	M.	71·1	324	11 43	+19	20 53	+14	—	52·6
Eskdalemuir	G.	71·3	323	11 33	+ 8	20 47	+ 5	33·9	35·9
Stonyhurst	M.	71·4	322	7 47?	?	i 15 41	? PR ₁	i 24·7	51·9
West Bromwich	—	71·5	320	11 30	+ 3	20 44	0	—	—
Shide	—	71·7	318	—	—	—	—	—	46·0
Bidston	M.S.	71·8	321	12 29	+61	21 59	+71	—	40·9
Barcelona	—	72·7	308	11 35	+ 1	20 57	-1	36·1	42·0
Algiers	B.M.	73·7	304	11 36	-4	21 7	-3	36·9	42·4
Tortosa	—	74·1	308	11 37	-6	21 13	-2	32·0	43·2
Adelaide	M.	75·6	142	11 33	20	21 3	-30	34·1	46·5
Rio Tinto	M.	80·3	308	7 53	?	—	—	—	87·9
Coimbra	—	80·5	310	12 27	+ 5	i 22 23	-6	39·9	50·6
San Fernando	—	80·6	306	12 11	-12	22 11	-19	45·4	50·9

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
Melbourne	M.	81.3	140	i 12 5	-22	i 22 5	-33	37.7	49.7
Riverview	—	82.4	134	i 12 22	-10	i 22 31	-19	e 35.3	39.4
Sydney	M.	82.4	134	10 53	-99	22 35	-15	48.6	54.8
Sitka	N.	87.4	24	23 49	? S	23 49	+ 4	e 44.1	49.2
	E.	87.4	24	23 53	? S	(23 53)	+ 8	e 45.8	54.8
Accra	M.	89.4	276	33 53	? L	—	—	(33.9)	36.9
Cape Town	M.	92.2	233	13 35	+ 7	23 23	-74	43.1	52.1
Honolulu	M.	97.1	62	32 5	? SR ₁	—	—	—	55.9
Victoria	—	98.7	23	24 7	? S	(24 7)	-96	46.1	64.0
	Z.	98.7	23	23 0	? S	32 6	? SR ₁	—	66.6
Apia	W.	101.7	97	e 18 53	? PR ₁	26 53	+41	41.9?	48.9
Ottawa	—	107.2	351	i 14 30?	-15	i 25 1?	-122	53.9	—
Northfield	B.O.	107.9	348	—	—	e 24 3	? S	e 46.9	—
Berkeley	E.	108.0	28	e 19 26?	? PR ₁	e 28 34	+84	—	—
	N.	108.0	28	e 19 22?	? PR ₁	e 28 26	+76	—	70.6
	Z.	108.0	28	e 18 26	? PR ₁	e 28 26	+76	—	—
Harvard	E.	B.O.	109.3	347	12 57	-117	28 10	+48	54.0
	N.	B.O.	109.3	347	15 20?	+26	27 5?	-17	54.5
Toronto	M.	109.4	353	15 47?	+52	26 29	-54	i 52.8	73.5
Ithaca	N.	—	110.2	351	e 19 10	? PR ₁	e 28 45	+75	e 55.5
	E.	—	110.2	351	e 26 57	? S	(e 26 57)	-33	48.1
Ann Arbor	E.	B.	111.0	357	—	—	—	—	60.9
	N.	B.	111.0	357	18 17	[- 8]	28 59	+82	59.9
	E.	W.	111.0	357	17 59	[-26]	—	—	48.9
	N.	W.	111.0	357	17 53	[-32]	30 23	? S	—
Washington	Mar.	113.8	351	10 53	? S	25 15	? S	51.9	—
Georgetown	—	113.8	351	e 19 48	? PR ₁	25 34	? S	e 47.3	—
Cheltenham	N.	B.O.	113.9	351	19 51	? PR ₁	e 30 28	? S	e 55.9
	E.	B.O.	113.9	351	19 39	? PR ₁	—	—	e 56.2
St. Louis	W.	114.8	2	e 19 47	? PR ₁	28 59?	+51	45.1	—
Tucson	B.O.	117.3	22	21 5	? PR ₁	—	—	55.7	64.2
Vieques	B.O.	130.2	331	22 54	? PR ₁	—	—	—	—
Balboa Heights	B.O.	143.6	346	19 43	[- 3]	—	—	—	—
Pilar	M.	158.4	250	—	—	—	—	43.9	53.2
La Paz	Bi.	159.0	295	20 2	[- 5]	34 7	—	69.9	71.7
Cipolletti	M.	159.2	228	—	—	—	—	37.7	44.2
Andalgala	M.	160.7	262	—	—	—	—	—	87.1

Additional records: Colombo gives M = +10.0m. Zi-ka-wei PME = +6m.17s., SR₁E = +12m.5s., MN = +16.2m. Manila iE = +8m.28s., iN = +8m.43s., MN = +19.8m. Kobe MN = +23.4m. Osaka MN = +21.9m. Athens mE = +10m.52s., mN = +12m.10s., mN = +18m.14s., mE = +18m.23s., LN = +31.7m., MN = +32.5m., T₀ = 10h.22m.9s. Zagreb eP = +10m.14s., iP = +10m.33s. and +10m.43s., PR₂ = +14m.25s., SR₁NW = +24m.12s., M = +39.9m. Perth PR₂ = +14m.45s. Pola MN = +39.2m., T₀ = 10h.22m.7s. Rocca di Papa L = +43.5m. and +58.8m. De Bilt i = +11m.17s., LN = +31.9m., MN = +37.6m., T₀ = 10h.22m.16s. Moncalieri P = +10m.58s., MN = +46.7m., T₀ = 10h.22m.9s. Paris PR₁ = +14m.14s., PR₂ = +17m.29s., T₀ = 10h.22m.24s. Eskdalemuir PR₁? = +14m.12s., PR₂ = +16m.28s., SR₁ = +26m.9s., M = +36.9m., T₀ = 10h.22m.24s. Barcelona PR₁ = +14m.28s., PR₂ = +16m.20s., SR₁ = +25m.58s., LN = +35.6m., MN = +40.5m., T₀ = 10h.22m.18s. Adelaide PR₁ = +14m.18s., SR₁ = +26m.18s., M = +43.6m. Coimbra MN = +44.0m. San Fernando S = +22m.23s., MN = +50.4m., T₀ = 10h.22m.16s. Melbourne PR₁ = +15m.5s., PR₂ = +17m.17s., SR₁ = +28m.23s., SR₂ = +32m.5s., SR₃ = +33m.23s. Riverview eP = +12m.17s., iP = +12m.41s., PR₁ = +15m.27s., PR₂ = +17m.23s., iS = +22m.26s., PS = +23m.0s., SR₁ = +27m.55s., SR₂ = +31m.5s., SR₃ = +33m.42s., T₀ = 10h.22m.12s. Honolulu gives its P as 5h.54m.12s., which was corrected by +5h. Victoria S = +32m.29s. Apia e = +32m.53s. Ottawa iN = +17m.53s., PR₁? = +18m.59s., i = +34m.23s., eL = +44.9m. Berkeley T₀? = 10h.28m.31s. Harvard PN? = +10m.20s., iN = +18m.53s., iE = +18m.55s., SN? = +24m.52s., eN = +33m.19s., eE = +33m.57s., eLN = +48.9m., LE = +49.3m. Toronto iS = +34m.17s., L = +39.3m., LE = +137.3m. Ithaca eN = +35m.5s., eE = +35m.11s. Washington PR₁? = +19m.41s., L = +56.9m. and +66.9m. St. Louis iE = +20m.47s., eLE = +58.4m. Tucson LN = +60.5m. Vieques PE = +23m.5s. La Paz SR₁ = +38m.13s. Andalgala MN = +105.5m.

This earthquake affords a good example of the difficulties which may attend the determination of precise elements, in spite of a wealth of material, and is accordingly worth special attention, if only to show cause why, in other cases when the material is only scanty, a solution may seem impossible. The fundamental characteristic of the observations is the difference in T_0 assigned by the near and far stations. For Simla and De Bilt the calculation of a correction to T_0 would stand thus:—

	Δ °	P. s.	S—P s.	Add $\frac{1}{4}$ s.	δT_0 s.
Simla	13.8	-36	-10	-12	-24
De Bilt	67.5	+5	+2	+3	+2

[The argument is that since $S-P=0.8P$ approximately we can infer the proper value (-12s.) of the P residual by adding one quarter of the S-P residual, which is, of course, independent of T_0 . The actual P residual -36s. can only be made to agree if we diminish T_0 by 24s.]

We may take these as representative of near and distant stations, and since the difference will be made still clearer presently, we need not dwell on it here, but may proceed to consider and clear out of the way possible corrections to the above solution.

The near stations indicate corrections to T_0 , which are consistently negative, and if we include all the stations as far as Lemberg ($\Delta=56^\circ$) we find a mean value -13s. But since the more distant stations do not agree (though this may be due to error of tables) we will adopt a rather smaller value, say -10s. The antitropical residuals will then be [+7s.] and [+5s.], and we may assume a focal depth of -0.10 (i.e., 0.10 above the standard. See Geop. Sup. to Mon. Not. Vol. I 1).

Station	Corr.		Obsd. $\delta \Delta$		Az.	C	Final		Residuals	
	Δ °	for -0.10	P °	S °			Δ °		P s.	S s.
Calcutta	5.2	0.0	-1.2	—	221	-0.7	4.5	—	7	—
Simla	13.8	+0.2	-2.1	-1.7	293	-0.9	13.1	-17	-19	—
Bombay	19.2	+0.4	-1.8	-1.9	251	-0.9	18.5	—	9	-19
Zi-ka-wei	26.1	+0.5	+0.5	—	73	+1.0	27.6	-5	(-78)	—
Taihoku	26.6	+0.5	+0.1	+0.5	86	+1.0	28.1	—	9	-8
Manila	29.5	+0.7	-0.9	+0.3	108	+1.0	31.2	-19	-12	—
Batavia	35.7	+0.8	-3.4	—	154	+0.4	36.9	-33	—	—
Kobe	37.7	+0.8	-0.1	—	67	+0.9	39.4	—	9	—
Osaka	38.0	+0.8	-0.3	-0.3	67	+0.9	39.7	-10	-17	—
Tokyo	41.4	+0.8	-0.2	—	67	+0.9	43.1	-8	(-49)	—
Lemberg	56.1	+1.1	+0.9	+0.3	314	-0.7	56.5	+11	+12	—
Zagreb	61.9	+1.2	+0.2	-0.1	310	-0.8	62.3	+7	+9	—
De Bilt	67.5	+1.2	+1.1	+0.2	318	-0.7	68.0	+12	+11	—
Uccle	68.3	+1.2	+0.5	+0.2	317	-0.7	68.8	+7	+10	—
Paris	70.0	+1.3	+0.7	-0.7	316	-0.7	70.6	+9	0	—
Eskdalemuir	71.3	+1.3	+1.5	0.0	323	-0.6	72.0	+13	+7	—

The column Δ is reproduced from the adopted solution. Then follows the correction to this Δ for the high focus. Next the P and S residuals, corrected for 10s. error in T_0 , are converted into corrections to the new Δ . (Thus, for Eskdalemuir, the new P and S are +11m.43s. and +20m.57s., corresponding to $\Delta=74^\circ.1$ and $72^\circ.6$, which exceed $71^\circ.3+1^\circ.3$ by $+1^\circ.5$ and $0^\circ.0$.) The Azimuth in the next column is reproduced from above, and on making a solution for $x \sin \text{Az} + y \cos \text{Az}$ the values $x = +1^\circ.0$ $y = +0^\circ.0$ were found, represented in the column C; equivalent to moving the epicentre nearly 1° further west to $26^\circ.5\text{N}$, $91^\circ.2\text{E}$. The column "Final Δ " is then the sum of columns 2, 3, and 7, and if we now compare the observations of P and S (increased by 10s., as above) with their tabular values corresponding to the "Final Δ ," we get the residuals of columns 9 and 10.

Now the systematic change between Tokyo and Lemberg is very clear. Let us omit from the first group the large -33s. for Batavia and the S residuals bracketed for Zi-ka-wei and Tokyo, which may be 1min. in error; even then the mean P residual is -10s. and S -15s., whereas for the six European stations the means are $P = +10\text{s.}$ and $S = +8\text{s.}$ There is a clear difference of some 20s. between the two sets. Does this mean that there were two shocks 20sec. apart, the first of which was noted by the near stations, but did not reach the far ones; but that the second shock being stronger was noted by them? There is one scrap of evidence in support of this view in the records hitherto received, but only one. Zi-ka-wei gives P at 10h.27m.56s. and PM at 10h.28m.24s., indicating that a maximum follows the first P at an interval of 28sec. If this represents a second shock the commencement probably precedes this M by a few seconds, and we may take the interval as perhaps 22sec. Let us adopt this hypothesis for trial, adopting

$T_0 = 10\text{h.}21\text{m.}45\text{s.}$ and $T_1 = 10\text{h.}22\text{m.}7\text{s.}$ (as adopted).

The question now arises, which of these is applicable to the anticeutral stations? As they are most distant of all, it should be T_1 rather than T_0 ; in which case the idea of a high focus gets no support from the observations at anticeutral stations, since the residuals will be as printed in the main solution, viz., $\{-3s.\}$ and $\{-5s.\}$. On the other hand, if for some reason the first shock at T_0 penetrates through the earth to the anticeutral stations the residuals will be such large positive quantities $\{+19s.\}$ and $\{+16s.\}$ that we should expect a higher focus still, say $-.020$ instead of $-.010$. Nevertheless, on trial it was found that no substantial alteration could be made in the solution just found, with an epicentre at $26^\circ 5'N$, $91^\circ 2'E$, with focus $.010$ above normal. It is even unnecessary to give the figures, for they are very similar to those just given, except that as a consequence of the two values for T_0 the residuals in the last column down to Tokyo must be increased by 12sec. and those below decreased by 10sec. We thus give as a definite solution:

Epicentre $26^\circ 5'N$, $91^\circ 2'E$.
Focus $.010$ above normal.

Two shocks: the earlier one at July 8d. 10h. 21m. 45s. reaches stations within $\Delta = 50^\circ$ only, and possibly those near the anticeutral. The second and stronger at July 8d. 10h. 22m. 7s. reaches stations outside this radius.

July 8d. Records also at 1h. (La Quiaca, Andalgala, and Cipolletti), 2h. (Taihoku), 4h. (La Paz and Pilar), 7h. (Andalgala), 11h. (Rocca di Papa), 15h. (Pompeii and Manila), 16h. (La Paz), 17h. (Zagreb), 21h. (San Fernando).

July 9d. 1h. 55m. 40s. Epicentre $9^\circ 3'N$, $129^\circ 3'E$. (as on 1913 April 24d. 10h.).

$A = -.625$, $B = +.764$, $C = +.162$; $D = +.774$, $E = +.633$;
 $G = -.102$, $H = +.125$, $K = -.987$.

An alternative solution would be $T_0 = 1h.55m.26s.$, with epicentre $6^\circ 5'N$, $128^\circ 0'E$. as on 1917 June 6d. and 1918 July 15d. 16h. This suits Batavia better, but Zi-ka-wei not so well.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	9.7	304	e 2 29	+ 3	4 32	+11	5.2	5.4
Zi-ka-wei	23.1	343	e 5 18	0	e 9 22	- 5	—	—
Batavia	27.3	236	e 5 20	-41	—	—	—	10.3
Colombo	49.0	271	29 20	?L	—	—	(29.3)	32.3
Honolulu	70.6	71	22 8	?S	(22 8)	+95	35.3	37.3
Helwan	92.1	301	24 20	?S	(24 20)	-16	—	—
De Bilt	N. 102.3	329	—	—	—	—	e 54.3	56.8
	E. 102.3	329	—	—	—	—	e 55.3	57.2
Eskdalemuir	104.3	334	—	—	—	—	49.3	—
Paris	105.5	327	—	—	—	—	e 57.3	—

Additional record: Manila gives $MN = +5.5m.$, $T_0 = 1h.55m.38s.$

July 9d. 14h. 1m. 10s. Epicentre $37^\circ 5'N$, $19^\circ 7'E$. (as on 1917 Nov. 28d.).

$A = +.747$, $B = +.267$, $C = +.609$; $D = +.337$, $E = -.941$;
 $G = +.573$, $H = +.205$, $K = -.793$.

It seems clear that this shock cannot be from the focus of July 11d. 9h. 48m., since the Athens record is relatively later and the following stations are relatively earlier.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3.2	81	0 59	+ 9	1 35	+ 7	1.8	2.3
Pompeii	5.2	310	i 1 22	+ 2	e 2 36	+14	—	4.8
Monte Cassino	6.0	312	1 53	+21	—	—	—	—
Rocca di Papa	6.8	311	1 32	-12	—	—	—	4.5
Zagreb	8.8	341	e 1 55	-18	i 3 49	- 9	—	4.4
Triest	9.2	333	e 3 8	+49	4 50	?L	(4.8)	—
Graz	10.0	343	e 2 20	-10	—	—	—	—
Vienna	11.0	348	e 3 20	+36	—	—	—	—
Paris	16.8	318	—	—	—	—	9.8	—
De Bilt	17.8	329	—	—	—	—	8.8	—

Additional records: Athens gives $MN = +2.0m.$, $T_0 = 14h.1m.23s.$ Zagreb
 $I = +3m.36s.$, $MNW = +4.5m.$ De Bilt $LN = +9.2m.$

July 9d. Records also at 3h. (Batavia, Manila, and Zi-ka-wei), 5h. (Andalgala, Cipolletti, and Riverview), 8h. (Taihoku), 9h. (Zi-ka-wei and Taihoku (3)), 12h. (Riverview), 13h. (La Paz and Monte Cassino), 14h. (Budapest and Moncalieri), 20h. (Melbourne and San Fernando).

July 10d. Records at 2h. (Manila), 9h. (Tokyo), 11h. and 13h. (La Paz), 16h. (Uccle), 21h. (Manila), 23h. (San Fernando).

July 11d. 9h. 48m. 5s. Epicentre $38^{\circ}0'N$. $21^{\circ}5'E$.

A = +.733, B = +.289, C = +.616; D = +.366, E = -.930;

G = +.573, H = +.226, K = -.788.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	1.8	91	0 29	+ 1	—	—	0.7	0.8
Pompeii	6.1	299	i 1 37	+ 4	i 2 44	- 2	—	4.4
Monte Cassino	6.9	303	1 49	+ 4	—	—	—	4.8
Rocca di Papa	7.7	302	1 56	- 1	3 23	- 6	—	5.4
Zagreb	8.8	334	i 2 14	+ 1	—	—	i 4.5	5.6
Pola	8.9	322	e 2 10	- 5	(e 3 46)	-15	e 3.8	5.6
Budapest	9.6	350	2 21	- 3	—	—	—	—
Graz	10.1	336	e 2 33	+ 2	—	—	—	—
Vienna z.	10.9	341	e 2 25	-18	—	—	—	—
Helwan	11.5	132	5 55	?L	—	—	(5.9)	—
Lemberg	11.9	8	e 5 43	?L	—	—	(5.7)	6.7
Moncalieri	12.4	308	e 3 8	+ 3	5 31	+ 2	7.1	8.8
Zurich	13.3	319	e 3 13	- 4	5 35?	-16	—	—
Hohenheim	13.9	325	i 3 16	- 9	—	—	—	—
Tortosa	16.4	287	4 3	+ 6	6 54	-10	7.6	14.8
Paris	17.4	314	i 4 8	- 2	i 7 29	+ 2	—	—
Uccle	17.6	322	e 4 8	- 4	e 7 25	- 6	—	—
De Bilt	18.1	326	4 17	- 1	7 45	+ 3	8.9	—
Bidston	22.9	320	—	—	8 49	-34	—	16.6
Eskdalemuir	24.0	324	5 14	-14	9 25	-19	11.3	—
Edinburgh	24.3	325	9 55	?S	(9 55)	+ 5	—	—

Additional records: Rocca di Papa gives MN = +5.9m. Zagreb iPNW = +2m.8s., i = +2m.20s., +2m.44s., and +3m.26s. Pola MN = +5.9m. Moncalieri MN = +9.6m., T_0 = 9h.48m.18s. De Bilt i = +8m.6s., T_0 = 9h.48m.4s.

July 11d. Records also at 3h. (La Paz), 4h. (Taihoku), 8h. (La Paz), 14h. (La Paz and Calcutta), 16h. (La Paz), 17h. (Calcutta, Helwan, and Bombay), 21h. (Riverview and Melbourne), 22h. (Honolulu, La Paz, San Fernando, and De Bilt), 23h. (Helwan).

July 12d. Records at 0h. (Lick, Tokyo, and Mizusawa), 1h. (Calcutta), 2h. (Mizusawa), 5h. (La Paz), 15h. (Colombo and De Bilt), 19h. (Rocca di Papa and Apia), 20h. (Helwan), 21h. (Georgetown, Washington, and Ottawa), 23h. (San Fernando and Lick (2)).

July 13d. Records at 12h. (Paris), 13h. (Zagreb and Rocca di Papa), 14h. (Lick), 17h. (Rocca di Papa).

July 14d. Records at 0h. (La Paz, Apia, and Rio Tinto), 1h. (San Fernando), 4h. (Osaka), 7h. (Taihoku), 9h. (Tokyo), 13h. (Zi-ka-wei), 18h. (Tucson, Georgetown, Ottawa, and Harvard), 19h. (Colombo), 22h. (Mizusawa).

1918. July 15d. 0h. 22m. 53s. Epicentre 41°1N. 126°6W.

A = -449, B = -605, C = +657; D = -803, E = +596;

G = -392, H = -528, K = -754.

Discussion of the residuals suggests moving the epicentre further east and a little south, say to 40°7N. 125°0W., which would reduce the negative residuals in the eastern States.

Station and Component.	Machine.	L	Azimuth.	P.		O-C.		S.		O-C.		L.		M.	
				M.	S.	S.		M.	S.	S.		M.		M.	
Berkeley	R.	—	4.6	134	i 1	8	—	3	—	—	—	e 2.1?	—	4.2	—
	N.	—	4.6	134	i 1	8	—	3	—	—	—	e 2.1?	—	3.7	—
	V.	—	4.6	134	i 1	7	—	4	e 2	0	— 6	e 2.2	—	2.7	—
Lick	W.	5.3	132	e 1	19	—	3	—	—	—	—	e 2.6	—	4.1	—
Victoria	M.	7.7	17	2	32	+35	—	—	—	—	—	4.0	—	6.0	—
	Z.	7.7	17	2	7	+10	—	3	53	+24	—	5.8	—	6.3	—
Tucson	N.	B.O.	15.3	120	3	49	+ 6	6	44	+ 5	—	8.0	—	9.6	—
	E.	B.O.	15.3	120	3	49	+ 6	6	48	+ 9	—	7.9	—	10.3	—
Sitka	N.	B.O.	16.9	343	4	21	+17	—	—	—	—	7.7	—	9.0	—
	E.	B.O.	16.9	343	4	23	+19	—	—	—	—	7.9	—	8.6	—
Saskatoon	Ma.	18.0	46	i 4	6	—11	—	i 7	21	—19	—	e 8.5	—	—	—
Lawrence	W.	24.0	85	e 5	21	— 7	—	9	57	+13	—	12.6?	—	13.1	—
St. Louis	N.	W.	27.8	83	i 5	49	—17	i 10	37	—18	—	e 12.1	—	16.3	—
	E.	W.	27.8	83	i 5	52	—14	—	—	—	—	e 16.2	—	—	—
Ann Arbor	E.	W.	31.7	73	6	31	—13	—	—	—	—	16.8	—	20.3	—
	N.	W.	31.7	73	6	31	—13	—	—	—	—	16.6	—	19.1	—
	E.	B.	31.7	73	6	13	—31	—	—	—	—	17.9	—	20.1	—
Honolulu	N.	B.	31.7	73	6	25	—19	13	7	+64	—	17.1	—	18.7	—
	M.	33.1	243	7	7	+10	—	—	—	—	—	14.2	—	17.1	—
Toronto	M.	34.5	70	—	—	—	—	i 12	7	—41	—	i 18.8	—	22.0	—
Ottawa	—	36.7	66	i 7	10	—18	—	i 12	49	—31	—	e 16.1	—	21.1	—
Washington	Mar.	37.5	76	7	16	—18	—	12	59?	—32	—	16.5	—	20.7	—
Georgetown	N.	—	37.5	76	e 7	21	—13	e 13	17	—14	—	e 16.8	—	21.2	—
	E.	—	37.5	76	i 7	18	—16	e 13	10	—21	—	e 16.8	—	21.2	—
Cheltenham	N.	B.O.	37.7	77	7	36	0	13	24	—10	—	e 19.1	—	21.5	—
	E.	B.O.	37.7	77	7	31	— 5	13	19	—15	—	18.8	—	23.6	—
Northfield	B.O.	39.1	67	7	10?	—37	—	13	18?	—35	—	e 20.0	—	24.6	—
Harvard	E.	B.O.	40.6	69	e 7	22	—38	13	25	—50	—	—	—	21.3	—
	N.	B.O.	40.6	69	7	38	—22	13	47	—28	—	e 19.1	—	22.1	—
Edinburgh	M.	71.8	30	20	7	?S	—	(20	7)	—41	—	—	—	40.6	—
Dyce	N.	Ma.	71.8	28	e 11	49	+21	i 20	54	+ 6	—	34.1	—	44.5	—
	G.	72.2	30	11	36	+ 5	—	21	7	+15	—	33.1	—	—	—
Eskdalemuir	M.S.	73.7	31	11	37	— 3	—	20	19	—51	—	—	—	45.1	—
Bidston	M.	73.7	30	22	13	?S	—	31	49	?	—	38.5	—	42.1	—
Stonyhurst	M.	76.3	31	—	—	—	—	—	—	—	—	—	—	46.1	—
Kew	—	76.5	32	21	46	?S	—	(21	46)	+ 3	—	33.6	—	48.6	—
Shide	—	77.8	28	12	10	+ 4	—	22	3	+ 5	—	33.1	—	38.5	—
De Bilt	N.	—	77.8	28	12	12	+ 6	—	—	—	—	34.1	—	36.3	—
	E.	—	78.6	29	e 12	7	— 4	e 22	7	0	—	e 35.1	—	44.1	—
Uccle	—	78.9	124	12	17	+ 5	—	e 22	15	+ 4	—	41.6	—	44.6	—
La Paz	Bi.	—	79.5	31	e 12	38	+22	i 22	19	+ 1	—	33.1	—	39.1	—
Paris	—	83.0	29	e 12	34	— 2	—	—	—	—	—	—	—	—	—
Zurich	M.	84.0	44	—	—	—	—	—	—	—	—	—	—	48.1	—
Rio Tinto	—	84.3	309	—	—	—	—	e 23	51	+40	—	—	—	—	—
Zi-ka-wei	S.	84.7	31	12	57	+11	—	23	16	0	—	35.5	—	50.1	—
Moncalieri	—	84.9	37	12	43	— 4	—	23	7	—11	—	37.6	—	46.9	—
Tortosa	—	84.9	24	—	—	—	—	—	—	—	—	e 37.1	—	—	—
Vienna	—	85.3	36	—	—	—	—	e 22	8	—74	—	33.4	—	50.2	—
Barcelona	—	85.5	41	30	7	?SR ₁	—	—	—	—	—	43.1	—	46.1	—
San Fernando	B.O.	85.5	18	—	—	—	—	e 23	19	— 6	—	e 44.3	—	49.7	—
Lemberg	W.	86.9	25	e 13	1	+ 3	—	e 23	29	—11	—	46.1	—	53.1	—
Zagreb	W.	87.0	27	—	—	—	—	e 24	7	+26	—	e 40.7	—	52.8	—
Pola	Ag.	89.3	29	e 13	12	0	—	e 24	2	— 4	—	e 47.9	—	—	—
Rocca di Papa	Ag.	89.3	29	e 13	7	— 5	—	e 24	12	+ 6	—	e 44.3	—	50.3	—
	B.M.	89.5	38	—	—	—	—	e 23	33	—36	—	46.1	—	48.6	—
Algiers	O.A.	90.9	28	i 16	11	?PR ₁	—	i 24	16	— 7	—	—	—	—	—
Pompei	M.	96.1	138	51	37	?L	—	—	—	—	—	53.9	—	61.4	—
Cipolletti	W.	96.5	296	—	—	—	—	23	35	?	—	—	—	—	—
Manila	M.	106.2	20	28	7	?S	—	28	7	+73	—	—	—	—	—
Helwan	M.	112.8	239	e 36	37	?SR ₁	—	—	—	—	—	—	—	63.7	—
Melbourne	M.	—	—	—	—	—	—	—	—	—	—	—	—	—	—

For Notes see next page.

NOTES TO JULY 15d. 0h. 22m. 53s.

Additional records: Saskatoon gives $T_0 = 0\text{h.}22\text{m.}56\text{s.}$, Toronto iL = +21.3m.
 Ottawa $T_0 = 0\text{h.}22\text{m.}55\text{s.}$ Harvard $SR_1 = +16\text{m.}25\text{s.}$, and $SR_2 =$
 $+16\text{m.}57\text{s.}$, $T_0 = 0\text{h.}22\text{m.}29\text{s.}$ De Bilt $T_0 = 0\text{h.}23\text{m.}8\text{s.}$ La Paz $SR_1 =$
 $+27\text{m.}15\text{s.}$, $T_0 = 0\text{h.}23\text{m.}10\text{s.}$ Moncalieri MN = +47.4m., $T_0 = 0\text{h.}23\text{m.}29\text{s.}$
 Barcelona LN = -36.2m., MN = -53.5m. San Fernando MN = +48.6m.
 Zagreb iP = +13m.21s., MNW = +52.1m. Pola MN = +54.4m.

July 15d. 16h. 18m. 36s. Epicentre $6^\circ 5\text{N. } 128^\circ 0\text{E.}$ (as on 1917 June 6d.).

A = -612, B = +783, C = +113; D = +788, E = +616;
 G = -070, H = +089, K = -994.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^\circ$	$^\circ$	m. s.	s.	m. s.	s.	m.	m.
Manila	10.7	320	e 2 39	- 1	4 45	- 3	5.3	6.4
Zi-ka-wei	25.5	347	—	—	—	—	e 8.3	—
Osaka	29.0	13	6 12	- 6	—	—	—	—
Mizusawa	34.7	17	—	—	—	—	25.3	—
Helwan	92.6	301	33 24	?L	—	—	(33.4)	—
Rocca di Papa	104.0	317	—	—	—	—	e 57.4	—
De Bilt	N. 104.0	329	—	—	25 11	-82	47.4	51.9
	E. 104.0	329	—	—	—	—	51.4	53.0
Edinburgh	105.8	336	52 24	?L	—	—	(52.4)	—
Moncalieri	105.9	321	—	—	—	—	e 51.4	—
Paris	107.1	327	—	—	—	—	e 58.4	—
Bidston	107.4	332	57 54	?L	—	—	(57.9)	64.8

Additional records: Manila gives MN = +6.2m. Mizusawa gives L = +25.6m.

July 15d. Records also at 0h. (Tokyo (2)), 5h. (Zurich and La Paz), 7h. (Tokyo),
 11h. (Algiers), 18h. (La Paz), 19h. (Moncalieri), 20h. (Kodaikanal),
 23h. (De Bilt).

July 16d. 11h. 49m. 42s. Epicentre $45^\circ 5\text{N. } 15^\circ 0\text{E.}$ (as on 1916 July 14d.).

A = +677, B = +181, C = +713.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^\circ$	m. s.	s.	m. s.	s.	m.	m.
Zagreb	0.8	e 0 14	+ 2	0 25	+ 3	—	0.4
Triest	0.9	0 14	0	—	—	—	—
Pola	1.0	e 0 25	?S	(e 0 25)	- 3	0.7	0.8
Graz	1.6	0 27	+ 2	—	—	—	—
Vienna	E. 2.9	e 0 48	+3	—	—	—	—
Rocca di Papa	4.1	e 1 30	+26	—	—	—	1.9
De Bilt	9.2	—	—	—	—	e 5.0	—

Zagreb gives i = +20s.

1918. July 16d. 20h. 3m. 36s. Epicentre $36^\circ 3\text{N. } 26^\circ 3\text{E.}$

A = +722, B = +357, C = +592; D = +443, E = -897;
 G = +531, H = +262, K = -806.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		$^\circ$	$^\circ$	m. s.	s.	m. s.	s.	m.	m.
Athens	—	2.6	311	i 1 0	+19	i 1 29	+15	1.6	1.8
Helwan	M.	7.7	145	1 54	- 3	—	—	—	7.9
Pompeii	O.A.	10.2	299	i 2 4	-29	i 3 49	-46	—	5.8
Monte Cassino	—	11.0	302	2 55	- 11	—	—	—	—
Rocca di Papa	Ag.	11.9	302	e 3 1	+ 3	—	—	e 7.7	—
	P.O.	11.9	302	i 3 7	+ 9	5 16	- 1	—	9.1
Zagreb	W.	12.2	324	e 3 7	+ 5	i 5 12	-12	i 6.0	7.0
Pola	W.	12.7	316	e 3 17	+ 8	e 5 30	- 7	e 5.5	9.2
Lemberg	B.O.	13.6	354	e 3 21	0	e 6 6	+ 8	—	7.4
Vienna	Z.	14.0	332	i 3 32	+ 6	—	—	—	—
Milan	—	15.8	311	3 53	- 4	—	—	—	9.1
Moncalieri	S.	16.5	308	4 2	+ 3	6 44	-23	10.2	13.6
Zurich	—	17.2	316	i 4 10	+ 3	7 24	+ 2	—	—
Marseilles	—	17.5	300	i 4 21	+10	i 7 39	+10	—	—

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Algiers	B.M.	18.8	278	4 1	23	7 51	- 2	14.4	22.4
Besancon	—	18.8	312	3 27	-57	6 55	-58	—	—
Barcelona	—	19.4	293	i 4 28	- 6	i 8 11	+ 1	—	—
Tortosa	—	20.6	291	4 47	- 1	8 34	- 2	10.8	16.0
Paris	—	21.4	313	i 4 56	- 2	i 8 50	- 3	11.4	13.4
Uccle	—	21.4	320	i 4 53	- 5	8 50	- 3	—	—
De Bilt	—	21.7	323	i 4 59	- 2	8 56	- 3	10.6	12.6
Kew	M.	24.2	317	—	—	—	—	—	9.4
Shide	—	24.4	315	5 23	- 9	9 52	0	—	—
San Fernando	—	26.1	280	6 54	+65	—	—	11.4	18.4
Stonyhurst	M.	26.5	320	i 6 54	+61	i 12 24	? 1.	(12.4)	15.9
Bidston	M.S.	26.6	320	5 36	-18	10 18	-15	—	—
Eskdalemuir	G.	27.6	323	5 52	-12	—	—	14.9	—
Edinburgh	M.	27.9	324	5 39	-28	—	—	—	22.4
Dyce	N. E.	28.2	327	e 6 56?	+46	e 11 54?	+51	16.7	22.9
		28.2	327	e 6 52?	+42	11 54	+51	16.7	22.4
Colombo	M.	56.8	108	16 24	? S	(16 24)	-80	—	37.4
Cape Town	M.	70.6	187	36 48	? L	—	—	(36.8)	43.0
Ottawa	—	72.3	314	e 11 30	- 2	(e 20 48?)	- 6	25.5?	—
Toronto	M.	75.5	314	—	—	—	—	44.5	—
Zi-ka-wei	—	75.8	62	e 12 35	+41	—	—	—	—
Washington	Mar.	76.8	339	17 19	? PR ₁	21 42?	- 5	—	—
Georgetown	—	76.8	309	e 17 51	? PR ₁	(e 21 42?)	- 5	e 21.7?	—
Osaka	O.	83.1	52	12 52	+15	—	—	—	—
Manila	—	85.1	75	—	—	—	—	—	23.0
Batavia	W.	86.1	101	e 22 24	? S	(e 22 24)	-67	—	—
Victoria	M.	91.1	340	—	—	—	—	—	46.9
La Paz	Bl.	103.2	259	16 45	?	—	—	e 43.4	—

Additional records : Athens gives $M = +2.2m$. Rocca di Papa $iL = +3.1m$, $M = +5.7m$. Zagreb $i = +3m.21s$. and $+4m.33s$, $MNW = +9.6m$. Pola $MN = +9.3m$. Moncalieri $MN = +11.3m$. Algiers gives its record as at 18d., but the record assigned to it by De Bilt is at 20d., so that it is almost certainly a misprint. Paris $M = +15.4m$, $T_0 = 20h.3m.40s$. Uccle $i = +4m.55s$. and $+9m.26s$, $T_0 = 20h.3m.32s$. De Bilt $m = +9m.1s$, $T_0 = 20h.3m.38s$. San Fernando $MN = +18.9m$. Ottawa gives S as $eL?$ and $e = +14m.0s$. Toronto $L = +47.0m$. Trieste $T_0 = 20h.3m.34s$. Graz $T_0 = 20h.3m.49s$.

July 16d. Records also at 1h. (San Fernando), 2h. (Batavia), 4h. (Paris), 10h. (La Paz), 11h. (Rocca di Papa), 15h. (Tokyo), 18h. (Rocca di Papa and Riverview), 19n. (Calcutta), 20h. (Osaka and Rocca di Papa), 21h. (Zi-ka-wei and Tokyo), 22h. (San Fernando and Tokyo), 23h. (La Paz, De Bilt, Riverview, Toronto, Victoria, and Cipolletti).

July 17d. Records at 0h. (Manila, Tokyo, Bidston, Edinburgh, Helwan, and Lick (2)), 13h. (Manila), 14h. (De Bilt), 15h. (Balboa Heights and Apia), 16h. (Manila), 18h. (La Paz).

July 18d. 21h. 5m. 5s. Epicentre $36^{\circ}5N$, $19^{\circ}7E$.

$A = -757$, $B = +271$, $C = +595$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3.5	66	0 51	- 4	1 27	-10	1.6	1.7
Pompeii	5.9	318	e 1 24	- 7	e 2 44	+ 3	—	—
Rocca di Papa	7.5	317	e 1 38	-16	—	—	—	4.0
Zagreb	9.7	345	e 2 57	+31	—	—	—	4.5
Moncalieri	12.4	317	—	—	—	—	e 5.7	—

July 18d. Records also at 0h. (San Fernando), 2h. (Manila), 6h. (Lick), 10h. (Manila), 12h. (La Paz), 13h. (La Paz), 14h. (Kew and Helwan), 22h. (Manila), 23h. (La Paz).

July 19d. 19h. 1m. 0s. Epicentre $45^{\circ}6'N. 10^{\circ}2'E.$

$$A = +.689, B = +.124, C = +.715; \quad D = +.177, E = -.984; \\ G = +.704, H = +.127, K = -.700.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Moncalieri	1.9	251	0 27	- 2	0 49	- 4	—	—
Zurich	2.1	327	e 0 26	- 7	i 1 2	+ 4	—	1.1
Pola	2.7	108	e 0 46	+ 4	—	—	1.1	1.3
Zagreb	4.0	85	e 0 56	- 6	—	—	1.8	2.2
Rocca di Papa	4.3	153	e 1 11	+ 4	—	—	—	2.2

Additional records: Zagreb gives $iP = +0m.59s.$, $MNW = +1.1m.$ Zurich
 $ePE = +0m.23s.$, $ePV = +0m.29s.$, $MN = +1.2m.$

July 19d. Records also at 0h. (San Fernando), 12h. (Apia), 13h. (Edinburgh),
 20h. (Mizusawa and La Paz), 21h. (Balboa Heights), 23h. (Lick (2)).

July 20d. Records at 2h. (San Fernando), 6h. (Bidston and Tokyo), 8h. (Kew),
 9h. (La Paz), 11h. (La Paz and Batavia), 12h. (Manila), 13h. (Manila
 and Paris), 14h. (Paris), 15h. Manila (2), 17h. (Manila), 18h. (Helwan
 and Mizusawa), 21h. (De Bilt and Melbourne).

1918. July 21d. 6h. 9m. 25s. Epicentre $7^{\circ}0'S. 155^{\circ}0'E.$

(as on 1916 Sept. 3d. and 1917 Dec. 20d., etc.)

$$A = -.900, B = +.420, C = -.122; \quad D = +.423, E = -.906; \\ G = +.111, H = -.052, K = -.993.$$

The T_0 adopted is about the mean of some rather discordant determinations,
 but the antical stations suggest that it should be increased by about
 15s., which would accord with Perth, Mizusawa, and Zi-ka-wei if an error
 of one minute is assumed in the last.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$		M. S.	S.	M. S.	S.	M.	M.
Riverview	—	27.1	187	e 5 47	-12	i 10 35	+ 8	12.3	15.8
Sydney	—	27.1	187	6 5	+ 6	9 41	-62	10.9	14.9
Adelaide	M.	31.8	206	7 0	+15	11 53	-12	16.0	20.0
Melbourne	M.	32.1	195	2 5	?	8 35	? PR ₁	15.5	16.3
Apia	W.	33.4	105	i 6 48	-12	e 12 35	+ 5	e 14.8	15.1
Manila	W.	40.1	303	e 7 58	+ 2	13 4	-64	14.2	15.0
Perth	M.	44.1	230	8 24	- 3	14 54	- 9	22.2	27.2
Tokyo	O.	45.0	344	8 48	+15	—	—	e 22.7	—
Osaka	O.	45.6	337	9 0	+23	—	—	20.2	24.0
Taihoku	O.	45.7	316	8 57	+19	15 31	+ 7	21.2	27.9
Batavia	W.	47.9	267	e 8 35	-18	—	—	—	28.6
Mizusawa	N.	47.9	345	8 59	+ 6	16 2	+ 9	—	—
	E.	47.9	345	9 3	+10	15 58	+ 5	—	—
Zi-ka-wei	—	49.9	322	e 10 24	+78	e 17 34	+76	—	32.8
Honolulu	M.	54.2	57	8 41	-53	16 53	-18	23.6	27.6
Ootomari	O.	54.8	350	16 58	? S.	(16 58)	-21	—	—
Colombo	M.	76.3	279	11 29	-28	(21 17)	-24	21.3	30.2
Kodaikanal	M.	79.1	283	20 5	?	—	—	22.6	53.4
Simla	O.E.	83.3	303	—	—	e 23 11	+11	—	23.3
Bombay	O.E.	85.0	290	13 0	+12	—	—	—	—
Sitka	N.	85.1	31	—	—	e 29 46	? SR ₁	—	—
Berkeley	—	88.6	52	—	—	e 23 35	-24	—	—
Lick	W.	89.0	52	—	—	e 29 35	? SR ₁	—	—
Victoria	M.	89.8	41	24 1	? S.	(24 1)	-11	42.2	59.9
Tucson	E.	B.O.	97.3	58	17 50	? PR ₁	26 25	+56	51.2
St. Louis	W.	113.7	51	20 5	? PR ₁	—	—	55.8	66.6
Ann Arbor	E.	B.	117.7	45	29 59	? S.	40 17	? SR ₁	59.3
	N.	B.	117.7	45	30 17	? S.	—	—	60.6
	E.	W.	117.7	45	30 5	? S.	—	—	68.6
	N.	W.	117.7	45	29 59	? S.	—	—	54.6
								61.6	—

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Cipolletti	M.	119.1	142	21 23	? PR ₁			66.4	97.4
Toronto	M.	120.1	43	21 53?	? PR ₁	31 5	+135	55.9	73.5
Lemberg	B.O.	120.9	225	20 41	? PR ₁			50.6	71.0
Cape Town	M.	121.9	222	30 41	? PR ₁	(30 41)	+98		72.6
Ottawa	—	121.9	40	20 39?	? PR ₁	30 31?	+88	53.6	—
Helwan	M.	122.5	301	20 35	? PR ₁				—
Ithaca	E. B.O.	122.6	43	e 37 13	? SR ₁			e 58.0	—
Washington	Mar.	123.4	47	e 17 5	+66	e 30 55	+100	55.6	—
Georgetown	—	123.4	47	e 20 50	? PR ₁	30 50	+95	55.6	—
Cheltenham	B.O.	123.8	48					63.4	69.6
Dyce	Ma.	124.1	347	21 7	? PR ₁	28 41	?	70.6	82.2
Northfield	B.O.	124.5	40	—				e 63.6	—
Budapest	E.	125.0	325	25 35	?				—
Vienna	E.	126.0	327	e 19 17	?				—
Harvard	B.O.	126.3	41	(e 21 7)	? PR ₁	i 30 50	+75	e 58.9	65.3?
Pilar	M.	126.4	138	22 23	? PR ₁			69.9	99.9
Andalgala	N.	127.2	133	25 23	?			73.9	88.1
	E.	127.2	133	25 53	?			73.8	79.7
Graz	W.	127.2	326	e 19 34	[+22]				—
Zagreb	W.	127.6	325	e 24 35	?			63.6	67.6
Chacarita	M.	127.7	145	25 53	?			66.9	75.4
Edinburgh	M.	128.1	345	21 35	? PR ₁				92.6
De Bilt	E.	128.6	337	e 21 46	? PR ₁	e 22 50	? PR ₁	e 59.6	61.4
	N.	128.6	337	—		e 22 52	? PR ₁	e 63.6	66.0
Eskdalemuir	G.	128.7	344	19 28	[+13]				—
Triest	W.	128.9	326	22 45	? PR ₁				—
Pola	W.	129.3	325	22 51	? PR ₁	(e 41 35)	? SR ₁	e 41.6	68.7
Stonyhurst	M.	129.8	343	i 22 29	? PR ₁	i 38 47	? SR ₁	i 66.3	82.2
Uccle	—	129.9	336	e 19 5	[−13]			e 59.6	70.6
Bidston	M.S.	130.3	343	19 47	[+28]				79.5
La Quiaca	M.	130.7	127	26 23	?				—
Zurich	M.	130.7	330	e 19 23	[+ 3]	30 15?	+10		—
Kew	M.	131.1	340	—					95.6
La Paz	Bl.	131.3	119	19 39	[+17]	33 39	?	60.6	69.2
Pompeii	M.	131.3	320	18 33	?				—
Rocca di Papa	Ag.	131.7	322	19 29	[+ 7]	23 0	? PR ₁	69.0	86.9
Shide	—	132.0	340	23 3	?			58.7	79.5
Paris	—	132.1	337	i 25 35	?			66.6	81.6
Moncalieri	S.	132.6	329	19 37	[+13]	33 28	?	63.8	80.9
Barcelona	—	137.9	329	23 18	? PR ₁	(e 41 52)	? SR ₁	69.8	85.6
Tortosa	—	139.2	330	18 9	?	23 23	? PR ₁		—
Algiers	B.M.	140.7	323	e 19 37	[− 3]			47.6	83.6
Coimbra	N.	143.6	339	17 48?	+23	33 0?	+96	e 52.6	—
	E.	143.6	339	19 52	[+ 6]	29 8?	−136	62.6	—
Rio Tinto	M.	145.0	334	18 35	+64				111.6
San Fernando	—	145.9	332	—	—			87.6	113.6

Additional records: Riverview gives $iP = +6m.8s.$, $i = +6m.39s.$, $iPR_1 = +6m.58s.$, $PS = +10m.56s.$, $MN = +16.8m.$, $MZ = +17.1m.$ Epicentre $6^\circ 08'. 153^\circ 0E.$, $T_0 = 6h.9m.10s.$ Adelaide $PR_1 = +7m.53s.$ Melbourne $SR_1 = +11m.53s.$, $?S.$ Apia $iP = +6m.43s.$, $M = +18.6m.$ Manila $MN = +15.2m.$ Perth $SR_1 = +18m.7s.$ Tokio gives L one hour early. Osaka $MN = +27.1.$ Colombo $M = +57.8m.$ Victoria $S = +31m.14s.$ ($?SR_1$). St. Louis $eLN = +45.6m.$ Toronto $L = +46.3m.$ and $L = +69.2.$ Ottawa $eL = +45.6m.$, $T_0 = 6h.18m.10s.$ Ithaca $eN = +37m.12s.$, $eLN = +54.3m.$ Washington $eL = +30.9m.$ ($?S$) and $+67.6m.$ Cheltenham $LN = +62.3m.$, $MN = +71.6m.$ Northfield $L = +75.6.$ Zagreb $e = +53m.35s.$, De Bilt epicentre $6^\circ 08'. 153^\circ 0E.$ Pola $MN = +68.9m.$ Uccle $ePR_1 = +22m.53s.$ La Paz $PR_1 = +23m.1s.$ Moncalieri $MN = +85.5m.$ Barcelona records SR_1 as L. San Fernando $MN = +106.6m.$

July 21d. 9h. 44m. 25s. Epicentre $7^{\circ}0'S. 155^{\circ}0'E.$ (as at 6h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	27.1	187	e 5 59	0	(10 45)	+ 2	13.4	16.9
Adelaide	31.8	206	11 38	?S	(11 38)	-27	20.1	22.3
Melbourne	32.1	195	—	—	—	—	16.2	20.4
Manila	40.1	303	e 7 56	0	(14 53)	+45	14.9	—
Perth	44.1	230	9 5	+38	17 4	?	26.2	—
Mizusawa	E. 47.9	345	8 55	+ 2	16 26	+33	—	—
N. 47.9	345	9 34	+41	16 12	+19	—	—	—
Batavia	47.9	267	e 8 35	-18	—	—	—	—
Honolulu	54.2	57	16 47	?S	(16 47)	-24	26.1	27.6
Colombo	76.3	279	46 35	?L	—	—	(46.6)	58.1
Victoria	89.8	41	—	—	—	—	—	56.4
Mauritius	94.2	249	31 35	?SR ₁	—	—	—	41.2
Toronto	120.1	43	—	—	—	—	—	77.5?
Ottawa	121.9	40	—	—	—	—	e 61.6	—
Zagreb	127.6	325	18 35	[-38] e	22 35	?PR ₁	65.6	—
De Bilt	128.6	337	—	—	—	—	65.6	—
Bidston	130.3	343	40 47	?SR ₁	—	—	—	74.0
La Paz	131.3	119	22 52	?PR ₁	—	—	—	—
Paris	132.1	337	e 24 35	?	—	—	69.6	—
Rio Tinto	145.0	334	85 35	?L	—	—	(85.6)	110.6

Additional records: Riverview gives eS = +10m.13s., SR₁ = +12m.9s., MN = +19.1m. The S in the table is given as PS. Adelaide S = +17m.13s., M = +23.3m. Perth PR₁ = +13m.48s.

July 21d. Records also at 3h. (Osaka, Mizusawa, Tokyo, and La Paz), 4h. (Helwan, Bidston, and De Bilt), 5h. (Tokyo), 7h. (Zagreb), 13h. (La Paz), 14h. (La Paz and Taihoku), 19h. (Mizusawa), 23h. (Manila).

July 22d. Records at 0h. (San Fernando), 4h. (Manila (2)), 5h. (Melbourne, Riverview, and Tokyo (?)), 12h. (Pola, Rocca di Papa, and Zagreb), 13h. (Zagreb), 16h. (Rio Tinto), 23h. (Tokyo).

July 23d. 13h. 22m. 17s. Epicentre $4^{\circ}5'S. 152^{\circ}0'E.$ (as on 1917 Sept. 24d. 20h.).

A = -0.880, B = +.468, C = -0.079; D = +.470, E = +.883;

G = +.069, H = -0.037, K = -0.997.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	29.2	182	e 3 49?	-151	10 13	-67	e 15.2	16.9
Sydney	29.2	182	7 31	+71	12 1	+41	15.2	17.2
Melbourne	33.9	190	—	—	12 43	+ 4	—	21.7
Manila	36.2	302	e 13 0	?S	(e 13 0)	-13	—	19.2
Perth	43.5	227	—	—	(14 5)	-50	23.7	—
Zi-ka-wei	46.1	323	e 8 46	+ 5	—	—	—	—
Honolulu	55.3	60	17 7	?S	(17 7)	-18	24.7	29.7
Berkeley	89.4	52	—	—	—	—	e 40.7	—
Victoria	89.9	41	—	—	—	—	45.2	56.0
Mauritius	92.2	250	42 43	?L	—	—	(42.7)	—
Helwan	118.7	302	74 43	?L	—	—	(74.7)	—
Toronto	120.2	40	—	—	—	—	65.1	75.5
Ottawa	121.8	38	—	—	—	—	e 62.7	—
Graz	123.4	326	—	—	—	—	e 67.7	—
Edinburgh	125.0	343	67 43	?L	—	—	(67.7)	—
De Bilt	E. 125.1	336	—	—	e 31 5	+98	e 64.7	72.7
N. 125.1	336	—	—	—	—	—	e 66.7	67.0
Eskdalemuir	125.5	343	—	—	—	—	74.9	—
Stonyhurst	126.5	342	—	—	—	—	—	80.3
Rocca di Papa	128.1	322	—	—	—	—	69.1	—
Paris	128.7	335	—	—	—	—	67.7	—
Moncalieri	128.9	329	—	—	—	—	74.8	—

Additional records: Riverview gives PS = +10m.44s. (?S), eSR₁ = +12m.55s., MN = +16.7m., MZ = +17.7m. Manila MN = +19.3m. Perth gives S as PR₁ and S = +17m.16s. Toronto eL = +69.2m.

July 23d. Records also at 0h. (San Fernando and Tokyo), 5h. (Tokyo), 9h. (Tokyo), 21h. (Edinburgh).

1918. July 24d. 10h. 53m. Os. Epicentre 42°OS . 178°OE .

A = -743, B = +026, C = -669; D = +035, E = +999;

G = +669, E = -023, K = -743.

Very doubtful. If we accept the Sydney P instead of the Riverview P, a $T_0 = 24\text{d.}10\text{h.}51\text{m.}20\text{s.}$, and the epicentre 22°OS . 180°OW ., as on 1917 May 24d.19h.20m.30s., would suit some of the records.

Station and Component.	Machine.	Δ	Azimuth.	P.	O - C.	S.	O - C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Riverview		22.6	282	e 5 12	0	9 17	0	e 11.9	15.5
Sydney		22.6	282	4 30	42	-	-	12.0	14.0
Melbourne	M.	25.5	268	10 6	? S	(10 6)	- 7	15.5	18.0
Apia	W.	29.5	20	e 3 30?	?	-	-	e 7.0?	14.0
Adelaide	M.	31.3	272	12 4	? S	(12 4)	+ 8	19.4	22.2
Perth	M.	49.6	260	27 54	? L	-	-	(35.9)	-
Andalgala	M.	88.6	127	50 18	? L	-	-	(59.3)	-
Berkeley		96.5	44	e 37 0	? L	-	-	(e 37.0)	-
Colombo	M.	100.7	270	47 0	? L	-	-	(47.0)	65.0
Victoria		104.1	36	-	-	-	-	44.6	58.3
Kodaikanal	M.	104.6	271	-	-	-	-	64.7	68.8
Georgetown		124.7	66	e 42 21	? SR ₁	-	-	e 53.4	-
Toronto	M.	125.4	60	-	-	-	-	e 63.6	66.7
Ottawa		128.5	59	-	-	-	-	63.0	-
Harvard	B.O.	130.3	65	-	-	e 42 46?	? SR ₁	65.9	-
Helwan	M.	150.6	256	28 0	?	-	-	-	-
Edinburgh	M.	166.1	3	81 0?	? L	-	?	(81.0?)	108.5
Eskdalemuir	G.	166.6	3	-	-	-	-	85.0	-
Stonyhurst	M.	168.2	1	e 76 36?	?	e 81 42	?	86.2	90.8
Bidston	M.S.	168.5	3	86 6	? L	90 18	?	(86.1)	97.6
De Bilt	E.	168.8	337	-	-	e 43 11	? SR ₁	e 96.0	96.9
	N.	168.8	337	-	-	-	-	e 88.0	91.1
Rocca di Papa		169.1	273	-	-	-	-	e 104.2	113.9
Kew	M.	170.4	353	-	-	-	-	-	98.0
Moncalieri	S.	172.4	296	-	-	-	-	e 92.6	-
Paris		172.5	337	-	-	-	-	e 88.0	91.0
San Fernando		173.6	148	45 30	? SR ₁	-	-	91.0	108.0

Additional records: Riverview gives PS = -9m.30s., SR₁ = +10m.42s., MN = +13.5m., MZ = +14.3m. Melbourne S = +13m.54s. Apia L = +9.5m. Adelaide S = +16m.4s. Colombo M = +76.0m. Ottawa eLN? = -52.0m. Harvard e = +49m.1s., eLN? = +53.4m., LN = +61.9m.

July 24d. Records also at 5h. (Batavia), 6h. (Sydney), 12h. (Mizusawa), 13h. (Zagreb), 14h. (Melbourne, Riverview, Sydney, and Perth), 15h. (Helwan, Tokyo, and Mizusawa), 19h. (Helwan), 22h. (San Fernando).

July 25d. 20h. 49m. 55s. Epicentre 35°ON . 143°OE . (as on 1917 Aug. 10d.).

A = -654, B = +493, C = +574; D = +602, E = +799;

G = -458, H = +345, K = -819.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Tokyo	2.7	284	0 44	+ 2	1 10	- 4	-	-
Mizusawa	4.4	340	1 9	+ 1	1 57	- 4	-	-
Osaka	6.2	269	2 6	+31	-	-	3.1	3.5
Kobe	6.4	269	1 54	+16	-	-	3.0	3.6
Ootomari	11.6	356	3 18	+25	4 54	-15	6.6	-
Zi-ka-wei	18.4	266	e 4 24	+ 2	e 8 7	+ 18	-	-
Manila	28.5	230	e 7 57	+104	14 14	+186	20.2	23.1
Colombo	64.1	263	39 35	? L	-	-	(39.6)	-
Budapest	E.	83.4	326	-	-	-	45.1	-
Edinburgh		84.7	342	23 5	? S	(23 5)	-11	52.6
Eskdalemuir		85.1	341	23 12	? S	(23 12)	- 8	42.1
De Bilt	N.	85.4	336	-	-	23 13	-10	44.8
	E.	85.4	336	-	-	-	-	47.8

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Zagreb	86.1	326	e 12 51	- 3	23 9	-22	47.1	55.1
Stonyhurst	86.2	340	47 29	?L	51 41	?L	(47.5)	56.4
Ucele	86.7	337	36 5	?	—	—	49.1	54.1
Bidston	86.8	340	30 5	?SR ₁	—	—	—	56.2
Triest	87.2	328	—	—	—	—	e 51.1	—
Kew	87.8	338	—	—	—	—	—	57.1
Helwan	88.6	306	24 5	?S	(24 5)	+ 6	—	—
Shide	88.7	340	—	—	—	—	42.1	—
Paris	89.1	335	—	—	e 23 36	-28	52.1	—
Rocca di Papa	90.7	326	16 48	?PR ₁	i 24 15	- 6	e 52.3	59.2
Ottawa	92.3	27	—	—	—	—	e 55.1	—
Barcelona	95.5	331	—	—	—	—	e 49.7	57.4
Algiers	99.2	329	—	—	—	—	54.1	64.1
Coimbra	100.2	340	—	—	—	—	e 51.4	—
Rio Tinto	101.9	336	58 5	?L	—	—	(58.1)	67.1
San Fernando	103.0	338	57 5	?L	—	—	62.1	61.6

Additional records : Manila gives MN = +21.3m. Zagreb MNW = +58.1m.,
 T₀ = 20h.50m.26s. San Fernando MN = +65.6m.

July 25d. Records also at 13h. (Helwan), 14h. (Algiers), 22h. (Mizusawa), 23h. (San Fernando).

July 26d. Records at 0h. (Colombo), 1h. (Riverview), 2h. (Helwan), 17h. (Colombo), 19h. (La Paz), 23h. (Manila).

July 27d. Records at 1h. (Taihoku), 2h. (Edinburgh and San Fernando), 3h. (Mizusawa and Tokyo), 11h. and 12h. (La Paz), 14h. (Barcelona), 15h. (Algiers), 16h. (Manila), 17h. (Rocca di Papa, Monte Cassino, and Pompeii), 21h. (San Fernando).

July 28d. Records at 10h. (San Fernando), 16h. (Tokyo and Mizusawa), 20h. (Mizusawa, Tokyo, and Balboa Heights), 21h. (Melbourne, Riverview, Pompeii, and Rocca di Papa), 22h. (Helwan).

July 29d. 11h.16m.39s. Epicentre 18° 3S. 167° 0E. (as on 1917 May 14d. 22h.).

A = -.927, B = +.214, C = -.309 ; D = +.227, E = +.974 ;
 G = +.301, H = -.070, K = -.951.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	21.3	219	4 57	0	e 8 51	+ 1	e 11.4	14.1
Melbourne	27.7	220	—	—	10 39	-15	16.0	19.4
Honolulu	52.2	43	15 27	?S	(15 27)	-79	21.4	28.6
Manila	55.9	303	e 10 21	+36	—	—	—	—
Batavia	59.8	273	e 9 21	-50	—	—	—	—
Victoria	90.7	39	—	—	—	—	44.4	52.0
Kodaikanal	92.8	280	55 21	?L	—	—	(55.4)	—
Ottawa	121.7	48	—	—	—	—	e 64.4	—
Helwan	138.0	295	82 21	?L	—	—	(82.4)	—
Edinburgh	141.4	351	82 21	?L	—	—	(82.4)	—
Bidston	143.8	350	80 33	?L	—	—	(80.6)	90.6
Paris	146.7	341	—	—	—	—	100.4	—
Rocca di Papa	147.7	323	i 18 42	?	—	—	—	—
San Fernando	160.6	343	67 21	?L	—	—	(67.4)	—

Additional records : Riverview gives PS = +9m.9s., MN = +15.6min.

1918. July 29d. 16h. 50m. 16s. Epicentre $1^{\circ}3S$. $143^{\circ}4E$.

A = -803, B = -596, C = -023; D = -596, E = -803;

G = +018, H = -014, K = -1000.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Manila	W.	27.3	308	e 5 58	- 3	i 10 50	+ 4	i 13.6	14.8
Riverview		33.3	168	e 6 26	-33	e 11 14	-75	e 13.4	17.6
Sydney	M.	33.3	168	9 8	+129	13 44	+75	16.2	17.7
Taihoku	O.	33.8	324	e 7 7	4			14.8	19.0
Adelaide	M.	33.9	187	11 27	?	(12 52)	+13	16.2	18.3
Melbourne	M.	36.5	178			12 14	-63	17.8	20.3
Batavia	W.	36.8	251	e 6 44	-44				16.7
Kobe	O.	36.8	348	e 7 18	10			16.4	19.2
Osaka	O.	36.8	348	7 26	- 2	13 31	+10	18.5	23.0
Tokyo	O.	37.1	355	7 40	+ 9				
Zi-ka-wei		38.6	330	7 30	-13	13 24	-22		19.9
Mizusawa	O.	40.5	358	7 57	- 2	14 7	- 7		
Honolulu	M.	61.5	64	10 26	+ 4	18 44	+ 2	28.7	43.9
Colombo	M.	64.0	279	10 44	+ 6	17 8	-125	23.3	27.1
Victoria	M.	93.2	42	22 20	?	33 57	?	54.6	68.9
Lemberg	B.O.	109.5	323	e 27 38	? S	(e 27 38)	+14	e 62.8	67.7
Helwan	M.	109.8	301	19 20	? PR ₁				29.6
Vienna	Z.	114.7	325	e 19 38	? PR ₁				
Graz	W.	115.8	324			e 27 44?	-32		
Zagreb	S.E.	116.1	322	i 19 41	? PR ₁	29 7?	+48	53.7	71.7
	N.W.	116.1	322	i 25 33	?	29 32	+73		63.7
Cape Town	M.	117.5	231	49 26	?			65.2	66.4
Triest	M.	117.6	323	27 56	? S	(27 56)	-35		
Dyce	N.	117.8	340					66.4	71.3
Pöla	W.	117.9	322	e 28 6	? S	e 28 6	-27	e 61.0	65.6
De Bilt		118.5	332			30 6	+88	e 58.7	60.1
Edinburgh	M.	119.1	340	24 44	?				74.2
Eskdalemuir	G.	119.6	339	e 20 25	? PR ₁	i 30 10	+84	e 56.7	
Uccle		119.6	332	e 18 44	7	e 30 14	+88		61.7
Rocca di Papa	Ag.	120.1	320	e 19 48	? PR ₁			e 64.5	
Stonbury	M.	120.5	337	4 14	?	i 30 50	+117		76.8
Badstun	M.S.	121.0	337	20 44	? PR ₁	30 32	+95		66.7
Moncalieri	S.	121.5	325	i 20 38	? PR ₁	37 3	? SR ₁	62.2	73.4
Paris		121.8	331	e 20 37	? PR ₁	e 30 33	+90	59.7	62.7
Shide		122.3	334	20 40	? PR ₁	30 38	+92		76.0
Toronto	M.	123.1	36						72.8
Ottawa		124.1	32			e 37 44?	? SR ₁	e 37.7?	
Barcelona		126.9	323	e 14 35	-99	32 41?	+182	e 60.9	70.7
Georgetown		127.3	40					61.7	
Washington	Mar	127.3	40	e 19 14	[+ 2]				
Tortosa		128.2	324	20 5	[+51]	31 44	+116	59.1	82.0
Harvard	B.O.	128.6	32					62.4	
Algiers	B.M.	129.0	318	e 20 53	? PR ₁	32 21	?	64.7	80.7
Rio Tinto	M.	134.3	327	22 44	? PR ₁				94.7
San Fernando		135.0	326	21 14	? PR ₁	68 44	? I.	79.7	94.2
La Paz	Bi.	144.1	122	19 42	[+ 5]	e 32 31	+64	70.5	74.7

Additional records: Manila gives MN = +14.4m. Riverview MN = +19.1m.
 MZ = -19.6m., T₁ = 16h.50m.36s. Adelaide S is given as PR₁, also
 S = 14m.22s., SR₁ = 15m.32s. Melbourne SR₁ = +14m.56s. Osaka
 MN = -20.9m., T₁ = 16h.15m.1s. Zi-ka-wei MN = +20.8m. Mizusawa
 SN = 14m.11s., T₁ = 16h.50m.26s. Dyce ME = +72.7m. Pöla
 MN = -74.7m., De Bilt PR₁ = 20m.18s., e = +36m.52s. Eskdale-
 muir i = +27m.22s., LN = +74.7m. Moncalieri MN = +74.5m. Har-
 vard LN = +61.9m., LE = +71.6m. San Fernando MN = +88.2m.

July 29d. Records also at 0h. (Rocca di Papa), 5h. (Helwan), 9h. (Manila), 12h. (Kodaikanal (2)), 15h. (Colombo and Kodaikanal), 16h. (Kodaikanal, Helwan, and Edinburgh), 18h. (Osaka, Tokyo, and Mizusawa), 20h. (La Paz), 22h. (Kodaikanal and Tokyo).

July 30d. Records at 0h. (San Fernando), 6h. (La Paz), 10h. (Perth, Tacubaya, and Taihoku), 11h. (Perth), 14h. and 15h. (La Paz), 16h. (Perth and Ootomari), 22h. (Mizusawa), 23h. (San Fernando).

1918. July 31d. 14h. 36m. 43s. Epicentre 11° 0N. 88° 0W.

A = +.034, B = -.982, C = +.191; D = -.999, E = -.035;
G = +.007, H = -.191, K = -.982.

Station and Component.		Machine.	Δ	Azimuth.	P.	O. C.	S.	O. C.	L.	M.
					M. S.	S.	M. S.	S.	M.	M.
Balboa Hts.	N.	B.O.	8.6	104	2 40	+30			4.7	5.6
	E.	B.O.	8.6	104	2 33	+23			4.8	6.0
Tacubaya			13.7	309	3 56	+34				
Vieques	N.	B.O.	23.0	67	4 55	-22				16.2
	E.	B.O.	23.0	67	4 43	-34	9 26	+ 1	11.4	17.4
Cheltenham	N.	B.O.	29.4	18			11 29	+ 5	16.0	19.1
	E.	B.O.	29.4	18			11 25	+ 1	15.8	17.4
Georgetown	N.	B.O.	29.6	17	e 6 18	- 6	11 36	+ 9	e 15.7	
	E.	Mar.	29.6	17	6 14	-10	11 26	- 1	15.9	
Washington	N.	B.O.	29.9	318					20.3	23.3
	E.	B.O.	29.9	318					18.3	33.3
Tucson	N.	B.	31.5	6	6 41	- 2	11 29	-31	17.2	18.7
	E.	B.	31.5	6			11 17	-43	18.7	19.6
Ann Arbor	N.	W.	31.5	6			11 35	-25	17.3	17.7
	E.	W.	31.5	6			12 11	+11	18.4	18.9
Ithaca	N.	B.O.	33.0	17	6 40	-16	e 11 52	-32	17.8	
	E.	B.O.	33.0	17	e 7 54	? PR ₁	e 13 40	? SR ₁	17.4	
Toronto		M.	33.5	11	11 53?	? S	(11 53?)	-39	20.5	23.4
La Paz		Bi.	33.8	144	e 7 4	+ 1	12 24	-14	16.8	18.8
Harvard		B.O.	34.7	22	7 44	+33	i 12 6	-45	e 19.1	22.5
Northfield		B.O.	35.7	19	e 8 17	? PR ₁	13 2?	4	20.0	
Ottawa			35.9	16	7 10	-11	13 9	0	e 17.9	
Berkeley			40.7	317			e 12 17	?		
Andagala		M.	44.0	152	15 5	? S	(15 5)	+ 3		
Victoria		M.	47.6	330			25 6?	? L	29.5	39.4
Cipolletti		M.	53.3	161	15 35	?			28.1	33.1
Chacarita		M.	53.6	149	15 35	?				
Honolulu		M.	67.6	289	11 47	+45	20 11	+14	32.5	37.1
Rio Tinto		M.	76.6	53	19 17	?				58.3
San Fernando			77.0	55	23 4?	?	35 1?	?	40.8	47.3
Eskdalemuir		G.	78.0	35	7 1	?			42.3	
Edinburgh		M.	78.1	34	21 17	? S	(21 17)	-44		48.3
Bidston		M.S.	78.2	38			33 23	? L	(33.4)	45.0
Stonyhurst		M.	78.6	38	15 29?	? PR ₁	i 23 29	+82		44.2
Shide			79.5	40					37.8	
Kew		M.	80.0	39						50.3
Tortosa			81.8	50	12 54	+25			39.8	38.3
Paris			82.2	42			e 23 17	+29	35.3	
Barcelona			82.9	49			(e 28 26)	? SR ₁	e 28.4	44.3
Uccle			83.0	40					e 37.3	38.3
De Bilt	N.		83.3	39			e 23 55	+55	e 36.3	38.5
	E.		83.3	39			e 23 9	+ 9	e 39.3	41.3
Algiers		B.M.	84.3	54			22 17	-54	22.3	45.3
Moncalieri		S.	86.3	46	10 50?	?	23 37?	4	36.2	52.7
Triest		W.	90.3	43					e 36.3	
Pola		W.	90.6	44	e 24 17	? S	(e 24 17)	- 3	e 45.6	54.0
Rocca di Papa		Ag.	90.6	47					e 45.0	58.2
Vienna			91.2	40					e 42.3	
Zagreb		W.	91.7	43	e 13 53	+28	e 24 5	-27	42.3	55.3
Lemberg		B.O.	95.3	38			25 17	+ 8		
Helwan		M.	108.9	52	25 17	? S	25 17	-121		
Cape Town		M.	109.8	122	58 35	? L			(58.6)	65.6
Sydney			121.6	236	57 47	? L			(57.8)	63.9
Riverview			121.6	236					e 53.0?	64.3
Melbourne		M.	125.7	230					65.3	69.8
Zi-ka-wei			129.2	327					e 81.8	
Manila		W.	141.5	311	e 19 54	[+12]				
Mauritius		M.	146.0	110	69 17	? L			(69.3)	81.8
Kodaikanal		M.	154.3	33	92 47	? L			(92.8)	
Colombo		M.	158.4	34					92.6	102.8

For Notes see next page.

NOTES TO JULY 31d. 14h. 36m. 43s.

Additional records: Georgetown gives eLN = +16.4m., T_0 = 14h.36m.20s.
 Toronto S = +16m.59s. Harvard eN = +8m.18s., iE = +15m.19s.,
 eLN = +18.6m., T_0 ? = 14h.27m.4s. Ottawa PR₁ = +8m.23s., SR₁ =
 +15m.17s., L = +21.3m., T_0 = 14h.36m.20s. San Fernando MN =
 +45.3m. Eskdalemuir LN = -36.3m. Moncalieri MN = +46.0m.
 Pola MN = +48.2m. Zagreb MNW = +48.3m. Cape Town L =
 -62.6m. Riverview MN = -67.1m.

July 31d. 21h.58m.45s. Epicentre 12°-6S. 150°-0E.

A = -845, B = +488, C = -218; D = +500, E = +866,
 G = +189, H = -109, K = -976.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	21.3	177	e 4 57	0	8 51	+ 1	e 11.6	13.6
Sydney	21.3	177	8 57	?S	(8 57)	+ 7	12.4	13.6
Adelaide	24.6	203	—	—	17 30	?L	20.3	22.2
Melbourne	25.6	189	—	—	10 15	+ 1	16.2	16.6
Perth	36.8	232	—	—	19 4	?L	26.6	—
Manila	39.6	314	e 8 45	?PR ₁	—	—	—	—
Honolulu	61.3	57	15 15	?	—	—	23.2	29.8
Lick	96.3	53	—	—	—	—	e 96.2	—
Victoria	97.2	42	—	—	—	—	46.3	56.6
Helwan	121.0	298	84 15	?L	—	—	(84.2)	—
Toronto	127.5	43	—	—	—	—	62.0?	70.4
De Bilt	E. 131.5	331	—	—	21 33	?PR ₁	e 72.2	82.4
	N. 131.5	331	—	—	39 45	?SR ₁	e 77.2	78.0
Edinburgh	132.0	340	72 15	?L	—	—	(72.2)	—
La Paz	132.4	127	—	—	—	—	63.2	—
Rocca di Papa	132.9	316	e 18 37	?	—	—	—	—
Tortosa	141.1	322	17 53	+38	—	—	80.4	108.3
Rio Tinto	147.3	325	103 15	?L	—	—	(103.2)	108.2
San Fernando	148.0	322	63 45	?L	—	—	(63.8)	—

Additional records: Riverview gives PS = +9m.11s., MN = +14.0m. Ade-
 laide PR₁ = +15m.40s., SR₁ = +19m.0s. Perth PR₁ = +15m.13s.

July 31d. Records also at 4h. and 9h. (Manila), 11h. (Helwan), 13h. (Manila),
 15h. (La Paz), 16h. (Tacubaya), 21h. (La Paz), 23h. (Edinburgh).

Aug. 1d. 11h. 42m. 0s. Epicentre 11°-0S. 176°-0W. (as on 1918 Feb. 6d. 3h.).

A = -979, B = -068, C = -191; D = -070, E = +997;
 G = +190, H = +013, K = -982.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	5.0	125	1 19	+ 2	2 2	-15	2.3	3.1
Honolulu	36.9	28	—	—	13 24	+ 2	16.5	17.9
Riverview	37.7	228	e 10 24?	+168	e 15 31?	+117	e 18.1	22.2
Sydney	37.7	228	13 18	?S	(13 18)	-16	21.3	23.0
Edinburgh	134.7	6	—	—	—	—	76.0	—
Eskdalemuir	135.4	6	—	—	—	—	75.0	—
De Bilt	138.9	359	—	—	—	—	78.0	87.0

Additional records: Riverview MN = +19.4m. De Bilt e = +72.0m.,
 eLN = +82.0m., M = +82.6m.

Aug. 1d. Records also at 0h. (La Paz and Balboa Heights), 4h. (La Paz and
 Honolulu), 6h. (Batavia), 8h. (Monte Cassino), 13h. and 16h. (Helwan),
 19h. (Osaka and Tokyo), 21h. (San Fernando).

Aug. 2d. 16h. 35m. Epicentre near La Paz. La Paz iP = 16h.35m.7s., L =
 16h.35m.55s., M = 16h.35m.58s. La Quiaca P = 16h.39m.6s.

Aug. 2d. Records also at 2h. (Rocca di Papa), 9h. (Riverview), 21h. (San Fer-
 nando).

Aug. 3d. Records at 2h. (La Paz), 5h. (Zi-ka-wei, Tokyo (2), and Taihoku),
 8h. (Riverview and Melbourne), 9h. (De Bilt and Helwan), 10h. (Helwan),
 13h. (Zagreb (2)), 22h. (Monte Cassino).

Aug. 4d. (I) 1h. 5m. 7s. } Epicentre 44° 0' N. 20° 0' E.
(II) 5h. 4m. 15s. }

A = +.676, B = +.246, C = +.695.

	Δ	P.	O - C.	S.	O - C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
I Zagreb	3.3	e 1 1	+ 9	i 1 46	+15	—	1.8
II Zagreb	3.3	e 1 10	+18	i 1 24	— 7	—	1.4
I Pola	4.4	1 26	+18	—	—	1.6	1.7
II Pola	4.4	e 1 3	— 5	—	—	e 1.3	1.4
I Rocca di Papa	5.8	e 1 34	+ 4	(2 50)	+11	—	3.8
I Zurich	E. 8.6	e 2 45	+35	e 3 51	— 2	—	—
I San Fernando	21.3	8 53	?S	(8 53)	+ 3	—	—

Zagreb I gives also iNE = +1m.32s. and +1m.38s., i = +1m.42s., iNW = +1m.52s., MNW = +1.9m. Zurich eSN = +3m.53s.

Aug. 4d. Records also at 10h. (Riverview and Melbourne), 16h. (Harvard, Georgetown, Washington, Algiers, and Ottawa), 19h. (La Paz), 20h. (Helwan and De Bilt), 21h. (Colombo), 22h. (Riverview and Melbourne), 23h. (De Bilt).

1918. Aug. 5d. 1h. 37m. 10s. Epicentre 30° 2' S. 177° 7' W.

(as on 1917 June 6d. (2) and Dec. 9d.).

A = -.864, B = -.035, C = -.503; D = -.040, E = +.999;
G = +.503, H = +.020, K = -.864.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	17.2	20	e 4 20?	+13	—	—	8.2	10.8
Riverview	26.6	254	e 5 47	— 7	(e 10 19?)	-14	e 11.7	16.6
Melbourne	31.7	246	12 2	?S	(12 2)	— 1	17.5	20.3
Adelaide	36.9	256	8 55	?PR ₁	(13 0)	-22	22.0	29.8
Batavia	74.3	272	e 11 50	+ 6	—	—	—	—
Cipolletti	84.8	133	22 8	?S	(22 8)	-69	—	—
Victoria	92.4	33	35 48?	?	42 41	?L	51.8	58.4
Andalgala	92.6	124	—	—	—	—	62.1	70.6
La Paz	97.7	114	e 14 43	+42	24 30	-63	47.9	52.2
Kodaikanal	107.9	272	60 56	?L	—	—	(60.9)	—
Capetown	114.1	195	65 26	?L	—	—	(65.4)	67.9
Toronto	115.9	53	—	—	—	—	64.8	—
Ottawa	118.9	52	—	—	e 28 20	-21	e 52.8?	—
Harvard	121.4	56	—	—	—	—	57.8	—
Edinburgh	154.0	7	58 50	?	—	—	—	101.8
Eskdalemuir	154.6	7	19 50	-12	—	—	—	—
Helwan	154.9	275	30 50	?	—	—	—	—
Stonyhurst	156.0?	7	72 2	?L	—	—	(72.0)	90.8
De Bilt	E. 158.0	353	e 24 56	?PR ₁	e 32 15	?	—	88.3
	N. 158.0	353	e 24 48	?PR ₁	e 31 20	?	e 84.8	90.8
Kew	158.6	5	—	—	—	—	—	106.8
Graz	160.3	332	—	—	—	—	e 94.8	—
Zagreb	161.1	329	—	—	—	—	e 111.8	—
Paris	161.4	0	e 24 50	?PR ₁	—	—	90.8	102.8
Rocca di Papa	165.7	327	e 25 14	?PR ₁	—	—	e 96.2	114.3
Tortosa	169.3	5	20 14	[0]	31 47	?	—	101.1
San Fernando	170.5	46	92 50	?L	—	—	(92.8)	—

Additional records: Riverview gives e(S?) = +9m.1s., MN = +17.2m., S recorded as SR₁. Melbourne S = +16m.8s., Adelaide S = +16m.0s., SR₁ = +20m.25s. Ottawa eLN = +62.3m., LE = +78.8m. De Bilt eN = +34m.47s., eE = +44m.32s., eN = +52m.57s. Paris e = +34m.50s. and +44m.50s., MN = +91.8m. Rocca di Papa M₁ = +32.2m., M₂ = +34.8m.

Aug. 5d. Records also at 0h. (Helwan, Apia, and San Fernando), 1h. (Perth and Bidston), 10h. (Zi-ka-wei), 11h. (Cipolletti), 21h. (Manila).

Aug. 6d. Records at 0h. (San Fernando and La Paz), 4h. (Manila and Riverview), 11h. (Manila), 15h. and 17h. (Mizusawa and Tokyo), 21h. (Apia), 23h. (Eskdalemuir, Stonyhurst, San Fernando, and De Bilt).

Aug. 7d. Records at 6h. (Rio Tinto, Manila, De Bilt, Tokyo, and Mizusawa), 7h. (Manila and La Paz), 9h. (Manila (2)), 14h. (De Bilt), 15h. (Kew), 17h. (Manila), 19h. (Zurich and Chur), 20h. (La Paz).

1918. Aug. 8d. 9h. 47m. 48s. Epicentre 6°0S. 153°4E.

(as on 1913 July 8d. 22h.).

$$A = -.886, B = +.451, C = -.104; \quad D = +.457, E = +.891; \\ G = -.093, H = -.047, K = -.995.$$

This is a good example of a compromise solution, where the errors of P and S are small but of opposite signs. To make them consistent we should increase T_0 by some 13s., to 9h.48m.1s. say. Then all the stations except Batavia demand smaller Δ s, which means "deep focus" (say .015). But the support from anticeutral stations is doubtful.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.	
				M. S.	S.	M. S.	S.	M.	M.	
Riverview		27.9	183	e 6	4	- 3	i 10 46	-11	e 13.8	14.5
Sydney	M.	27.9	183	6	12	+ 5	11 0	+ 3	13.4	14.7
Melbourne	M.	32.7	192	12	12	? S	(12 12)	- 7	17.1	20.0
Manila	W.	37.9	303	e 7	40	+ 3	13 28	- 9	20.1	20.9
Perth	M.	43.3	228	8	30	+10	14 46	- 6	23.1	—
Osaka	O.	44.0	339	9	46	? PR ₁	—	—	—	21.1
Batavia	W.	45.9	268	e 9	12	+33	—	—	—	20.2
Zi-ka-wei		47.9	325	e 8	57	+ 4	e 15 27	-26	e 19.7	25.2
Honolulu	M.	55.3	59	9	42	+ 1	17 36	+11	26.3	33.2
Columbo	M.	74.1	279	20	12	? S	(20 12)	-63	—	—
Kodakungal	M.	76.7	282	50	24	? L	—	—	(50.4)	—
Barkley		89.4	52	—	—	—	e 21 12	?	—	—
Victoria	M.	90.3	41	23	57	? S	(23 57)	-20	32.2	54.0
		90.3	41	24	6	? S	(24 6)	-11	41.7	46.7
Mauritius	M.	92.6	249	12	54	-36	(22 42)	-119	40.2	51.7
Tucson	B.O.	98.3	58	—	—	—	—	—	45.6	53.8
Ann Arbor	B.	118.3	45	30	30	? S	(30 30)	+114	50.3	65.2
Helwan	M.	120.4	301	21	12	? PR ₁	—	—	—	—
Toronto	M.	120.8	42	—	—	—	(37 36)	? SR ₁	i 61.3	71.5
Cape Town	M.	121.4	223	32	6	?	—	—	—	75.9
Ottawa		122.4	39	20	40	? PR ₁	30 32	+85	62.2	—
Ithaca	B.O.	123.2	42	—	—	—	(e 49 42)	?	58.5	—
Vienna	W.	124.0	326	—	—	—	—	—	e 62.2	—
Washington	Mar.	124.2	46	20	41	? PR ₁	30 34	+74	59.7	—
Georgetown		124.2	46	e 21	20	? PR ₁	e 30 41	+81	61.8	—
Chetumham	B.O.	124.4	46	—	—	—	—	—	61.2	67.2
Northfield	B.O.	124.8	39	—	—	—	—	—	e 62.2	—
Dye	M.	125.1	344	—	—	—	—	—	69.2	—
Graz	W.	125.3	326	e 20	12	? PR ₁	—	—	—	—
Zagreb	W.	125.6	324	e 21	8	? PR ₁	e 31 6	+96	63.2	77.2
Edinburgh	M.	126.6	344	19	42	?	—	—	—	82.2
Harvard	B.O.	126.7	40	—	—	—	(e 37 29?)	? SR ₁	63.2	—
De Bilt		126.9	336	(e 21	20)	? PR ₁	e 22 40	?	e 56.2	60.2
Triest		127.0	325	—	—	—	—	—	e 55.2	—
Eschdammir	G.	127.2	343	21	19	? PR ₁	32 57	+136	55.2	74.8
Hohenheim		127.4	331	e 18	47?	[-25]	—	—	—	—
Pala	W.	127.4	324	e 22	24	? PR ₁	—	—	—	75.9
Railboa Hts.	B.O.	127.8	83	14	56	-81	—	—	15.4	15.5
Uccle		128.1	335	e 22	30	? PR ₁	—	—	e 56.2	70.2
Bidston	M.S.	128.7	342	22	48	? PR ₁	33 12	?	—	79.9
Kew	M.	129.4	339	—	—	—	—	—	—	88.2
Roca di Papa	Ag.	129.8	322	e 20	8	? PR ₁	—	—	e 65.1	77.5
Shade		130.4	339	—	—	—	—	—	e 57.4	—
Paris		130.5	335	e 22	53	? PR ₁	—	—	54.2	60.2
Moncalieri	S.	130.7	328	e 21	48?	? PR ₁	36 59?	? SR ₁	54.7	76.7
La Paz	Bi.	133.5	119	e 19	40	13}	32 40	+136	62.8	95.7
Barcelona		136.1	328	—	—	—	—	—	e 63.2	71.4
Tortosa		137.4	329	22	36	? PR ₁	—	—	64.7	90.2
Algiers	B.M.	138.7	323	e 22	47	? PR ₁	—	—	69.2	79.2
Vieques	B.O.	140.6	68	—	—	—	—	—	71.2	75.2
Coimbra		141.9	337	20	42	[+59]	32 55	+101	67.9	79.0
Requinto	M.	143.2	333	47	12	?	—	—	—	115.2
San Fernando		144.1	332	19	12	35	—	—	67.7	96.2

For Notes see next page.

NOTES TO AUGUST 8d. 9h. 47m. 48s.

Additional records: Riverview gives $i = +6m.19s.$, $PS = 11m.17s.$, $iSR_1? = +12m.46s.$, $MZ_1 = -15.1m.$, $MN_2 = -15.3m.$, $T_0 = 9h.47m.57s.$, Melbourne $S = +15m.54s.$, $SR_1 = +16m.24s.$, Perth $SR_1 = +17m.57s.$, Osaka $MN = +22.5m.$, Honolulu $T_0 = 9h.47m.42s.$, Victoria $S = SZ - +29m.51s.$, Toronto $E = -46m.42s.$, LE $-60.2m.$, LE $-67.7m.$, Ottawa $SR_1N = +37m.16s.$, cLE $-18.2m.$, L $-52.2m.$, and $+62.2m.$, $T_0 = 9h.56m.34s.$, Ithaca $LN = +59.8m.$, Washington $SRPE = +36m.42s.$, L? $= +46.7m.$, L $= +56.7m.$, Georgetown cLN $= +20m.31s.$, Cheltenham $LN = +60.2m.$, Zagreb $e = +58m.12s.$, MNW $= +72.2m.$, Harvard LS at $+50.5m.$, $+55.7m.$, $+58.5m.$, $+62.1m.$, and from $+69.0m.$ to $+71.4m.$, De Bilt Epicentre $7^{\circ}08'.150^{\circ}1E.$, Eskdalemuir $SR_1 = +39m.34s.$, $SR_2 = +44m.24s.$, MN $= +78.3m.$, Pola MN $= 73.5m.$, La Paz $PR_1 = +21m.58s.$, $SR_1 = +35m.34s.$, $SR_2 = +40m.52s.$, Barcelona cL $= +46.0m.$, MN $= +77.3m.$, Coimbra MN $= +78.9m.$, San Fernando MN $= +94.2m.$

Aug. 8d. Records also at 0h. (San Fernando), 3h. (Tokyo), 5h. (De Bilt, Helwan, and Colombo), 10h. (Apia), 11h. (Mauritius and Andalgalá), 12h. (Manila and Riverview), 2h. (Tokyo), 17h. (La Paz).

Aug. 9d. 0h. 38m. 40s. Epicentre $40^{\circ}8'N.$, $35^{\circ}8'E.$

A = +614, B = +443, C = +653; D = +585, E = -811;
G = +530, H = +382, K = -757.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	E.	9.8	257	2 28	+ 1	4 29	- 6	5.0	5.9
	N.	9.8	257	2 27	0	4 25	+ 2	4.8	5.3
Helwan		11.5	200	4 44	?S	(4 44)	- 23	(6.2)	12.7
Lemberg		12.2	321	15 7	?S	(5 7)	-17	7.9	8.1
Zagreb		15.2	296	3 41	- 1	16 48	+11	18.0	9.2
Pompeii		16.1	277	e 3 48	- 5	e 7 20	+23	—	—
Pola		16.5	291	e 4 3	+ 4	e 7 3	- 4	e 8.8	10.8
Rocca di Papa		17.4	281	e 4 24	+14	7 24	- 3	—	10.2
		17.4	281	e 4 18	+ 8	8 8?	?SR ₁	e 11.6	—
Milan		19.9	292	5 52	+72	—	—	—	12.1
Zurich		20.5	298	e 4 18	+ 1	—	—	—	—
Moncalieri		20.9	291	4 57	- 5	8 46	+ 4	11.1	12.3
De Bilt		23.7	309	5 28	- 3	9 35	- 3	11.2	16.4
Uccle		23.9	305	e 5 25	- 2	e 9 38	- 4	e 12.3	—
Paris		24.7	300	e 5 38	+ 3	19 52	- 5	13.3	17.3
Barcelona		25.2	283	5 40	0	10 2?	- 5	e 12.2	16.6
Algiers		25.7	272	e 5 29	-16	9 35	-41	13.3	16.3
Tortosa		26.2	282	5 50	0	10 14	-12	11.9	18.1
Kew		26.8	306	—	—	—	—	—	20.3
Shide		27.4	304	e 9 32	?S	(e 9 32)	-76	(15.4)	—
Stonyhurst		28.6	310	5 20?	-54	11 38	+28	—	20.8
Bidston		28.9	309	15 32	?L	—	—	(15.5)	21.3
Eskdalemuir		29.3	313	—	—	11 2	-20	14.3	—
Dyce		29.3	317	—	—	—	—	19.3	—
Edinburgh		29.4	314	10 50	?S	(10 50)	-34	—	21.8
Rio Tinto		32.7	279	—	—	13 20	-61	—	23.3
San Fernando		32.8	276	5 50	-65	(14 20)	?SR ₁	14.3	18.8
Coimbra		33.3	284	—	—	12 3	-26	18.2	—
Colombo		51.7	119	32 20	?L	—	—	(32.3)	—

Additional records: Helwan records L as S and S as P. Zagreb gives $iNW = +3m.47s.$, $eMNW = 8.3m.$, $iMNE = -8.4m.$, Pola MN $= 10.9m.$, $T_0 = 0h.39m.1s.$, De Bilt M $= +13.6m.$, $T_0 = 0h.38m.59s.$, Epicentre $38^{\circ}7'N.$, $31^{\circ}6'E.$, Rio Tinto gives its S as 8d.0h. instead of 9d. San Fernando gives its P record 10 minutes too early. Coimbra LN $= +15.8m.$

Aug. 9d. Records also at 1h. (Zi-ka-wei), 2h. (San Fernando), 7h. (Coimbra), 14h. (Zi-ka-wei), 15h. (Manila), 19h. (La Paz and Manila), 20h. (La Paz, Helwan, and De Bilt), 21h. (La Paz).

Aug. 10d. 18h. 44m. 32s. Epicentre $42^{\circ}5'N$. $7^{\circ}5'E$.

A = +.731, B = +.096, C = +.676; D = +.130, E = -.991;
G = +.669, H = +.088, K = -.737.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Marseilles	1.7	298	i 0 22	- 4	i 0 42	- 6	2.6	—
Moncalieri	2.5	3	0 35	- 4	1 2	- 7	1.2	1.6
Milan	3.2	22	1 19	+29	1 59	+31	—	4.0
Rocca di Papa	3.9	99	e 0 38	-23	—	—	e 2.6	7.5
Barcelona	4.1	256	1 19	+15	—	—	2.1	6.2
Besancon	4.8	348	1 58	+44	3 20	+69	—	—
Zurich	4.9	9	e 1 20	+ 4	i 2 2	-12	—	—
Pola	5.2	61	1 43	+23	—	—	e 3.3	4.3
Triest	5.5	52	e 1 39	+14	—	—	—	—
Pompei	5.5	106	e 2 23	?S	(2 23)	- 8	—	—
Tortosa	5.5	254	1 9	-16	2 5	-26	2.2	3.9
Hohenheim	6.4	10	e 1 16	-22	—	—	—	—
Algiers	6.6	212	e 1 33	- 8	—	—	—	—
Zagreb	7.0	58	e 1 58	+12	e 4 39	+89	—	5.4
Paris	7.2	333	e 1 42	- 7	e 2 55	-20	3.6	—
Graz	7.3	48	e 2 45	+54	—	—	—	—
Vienna	8.5	44	e 3 46	?S	(e 3 46)	- 4	—	—
Uccle	8.6	347	e 2 46	+36	e 4 10	+17	—	7.3
De Bilt	9.7	351	—	—	—	—	4.8	5.7
Granada	10.0	242	4 30	+120	6 13	+104	—	—
Shide	10.2	327	5 25	?L	—	—	(5.4)	—
Kew	10.4	332	—	—	—	—	—	6.5
Coimbra	12.1	264	3 41	+41	6 33	+72	8.2	10.4
Eskdalemuir	14.6	335	—	—	—	—	7.5	—
Helwan	22.9	116	9 28	?S	(9 28)	+ 5	—	—

Additional records: Moncalieri MN = +2.2m. Rocca di Papa transposes
L and M. Zurich ePN = +1m.7s., iN = +2m.31s., iE = +2m.28s.
Pola MN = +4.4m. Algiers gives ? = +3m.43s., LM = +11.0m. De
Bilt LN = +5.5m., M = +8.5m. Coimbra eN = +5m.31s., LN = +10.0m.

Aug. 10d. Records also at 2h. (Helwan, Moncalieri, La Paz, and De Bilt), 8h. (Eskdalemuir), 11h. (Kew and San Fernando), 15h. (De Bilt and La Paz), 18h. (Riverview and Manila), 19h. (La Paz).

Aug 11d. 10h. 49m. 57s. Epicentre $16^{\circ}0'S$. $168^{\circ}0'E$. (as on 1917 May 29d., Aug. 16d., Sept. 5d., 9d., 20d., Oct. 20d., Nov. 29d.).

A = -.940, B = +.200, C = -.276; D = +.208, E = +.978,
G = +.270, H = -.057, K = -.961.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	23.4	217	(e 5 21)	0	(e 9 33)	0	—	—
Cipolletti	104.0	138	33 51	?SR ₁	—	—	—	—
Cape Town	122.2	210	29 3	?S	(29 3)	- 3	—	35.0
La Paz	115.8	118	e 11 28?	—	—	—	44.5	56.3
Algiers	155.3	330	—	—	—	—	67.0	—
Helwan	138.0	297	61 3	?L	—	—	(61.0)	—
De Bilt	141.4	343	e 44 3	?[L]	—	—	e 69.0	76.1
Moncalieri	146.6	334	e 68 34	?L	—	—	(68.6)	—

It is assumed that the times given by Riverview are one hour wrong; they are given as +65m.21s. and +69m.33s. respectively. But the identification is very doubtful and rest chiefly upon the former activity of this epicentre, the Riverview observations, and the values of L. If we omit the Riverview observations as possibly due to a later shock, then an epicentre at $73^{\circ}0'S$. $90^{\circ}0'E$. would fit the other records better. De Bilt gives also MN = +74.8min.

Aug. 11d. 13h. 23m. 25s. Epicentre $45^{\circ}0'N$. $4^{\circ}8'E$.

$A = +.705$, $B = +.059$, $C = +.707$; $D = +.084$, $E = -.996$;
 $G = +.705$, $H = +.059$, $K = -.707$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Marseilles	1.7	167	i 0 34	+ 8	i 0 54	+ 6	—	2.2
Moncalieri	2.1	89	e 0 37	+ 4	1 10	+12	2.0	2.1
Besancon	2.4	20	1 26	?S	(1 26)	+20	(2.8)	—
Milan	3.1	80	1 29	?S	(1 29)	+ 3	—	4.3
Zurich	3.5	46	e 1 20	+25	i 2 13	+36	i 2.5	—
Barcelona	4.0	206	e 1 1	- 1	1 41?	- 9	e 2.0	6.6
Paris	4.1	339	e 1 48	?S	(e 1 48)	- 5	(i 3.0)	—
Tortosa	5.2	219	1 12	- 8	2 15	- 7	2.3	4.0
Hohenheim	5.4	38	e 0 49	-34	—	—	—	—
Uccle	5.7	357	e 2 11	+43	(e 2 11)	(-25)	e 4.3	7.4
Triest	6.3	81	e 2 44	?S	(e 2 44)	- 8	—	—
Pola	6.5	88	e 1 36	- 3	—	—	e 3.4	4.2
Rocca di Papa	6.6	117	i 0 54	-47	1 51	?P	—	2.7
Shide	6.7	327	—	—	—	—	5.2	7.3
De Bilt	7.0	1	—	—	—	—	4.3	6.0
	7.0	1	—	—	—	—	5.2	6.8
Graz	7.7	71	1 50	- 7	—	—	—	—
Zagreb	7.9	80	4 44	?L	i 4 59	?L	(5.0)	6.8
Algiers	8.3	186	2 12	+ 6	4 5	+20	—	9.6
Pompeii	8.4	118	e 0 59	-68	e 2 38	-72	4.5	—
Vienna	8.6	63	e 3 53	?S	(e 3 53)	0	—	—
Bidston	9.7	331	3 59	?S	(3 59)	-22	—	9.6
Budapest	10.2	71	—	—	e 4 30	- 5	—	—
Coimbra	10.6	249	—	—	e 4 20	-25	8.5	10.6
Eskdalemuir	11.4	336	—	—	—	—	6.6	—
San Fernando	12.0	228	1 35	-84	—	—	—	—
Dyce	12.8	343	—	—	8 43	?	11.1	12.3
Lemberg	13.9	62	—	—	e 5 35	-31	—	11.2

Additional records : Marseilles MN = +1.6m. Moncalieri gives i = +0m.53s.,
 MN = +2.5m. Zurich ePN = +1m.15s., ePZ = +1m.18s. Paris
 LE = +3.8m., LN = +3.9m. Uccle iZ = +4m.47s. Pola MN =
 +4.5m. Rocca di Papa i = +0m.50s., eL = +4.6m., MN = +3.2m.
 Zagreb iM = +5.5m. Coimbra SN = +5m.53s., SE = +6m.1s., MN =
 = +11.4m.

Aug. 11d. 14h. 2m. 10s. Epicentre $45^{\circ}0'N$. $4^{\circ}8'E$. (as at 13h.).

$A = +.705$, $B = +.059$, $C = +.707$.

	Δ	P.	O-C.	S.	O-C.
	°	m. s.	s.	m. s.	s.
Moncalieri	2.1	0 28	-5	0 50	- 8
Zurich	3.5	—	—	e 1 40	+ 3
	3.5	—	—	e 1 41	+ 4
	3.5	—	—	e 1 49	+12

Aug. 11d. 18h. 2m. 5s. Epicentre near Pompeii, which gives eP = +13s., eS =
 +23s. Rocca di Papa gives i = +1m.34s.

Aug. 11d. 23h. 28m. 0s. Epicentre $5^{\circ}4'N$. $125^{\circ}2'E$.

The first of a series of twelve shocks in August from this epicentre or near it.
See introductory note.

$$A = -.574, B = +.813, C = +.094; \quad D = +.817, E = +.576; \\ G = -.051, H = +.077, K = -.996.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	10.1	336	e 2 24	- 7	5 2	+30	6.0	7.3
Batavia	21.7	238	e 5 0	- 1	—	—	—	—
Helwan	90.7	298	25 0	?S	(25 0)	+40	—	—
De Bilt	E. 103.4	327	—	—	—	—	e 56.0	66.4
	N. 103.4	327	—	—	—	—	e 55.0	58.9
Eskdalemuir	105.9	331	—	—	—	—	53.0	—
San Fernando	118.3	317	74 0	?L	—	—	(74.0)	—

Manila gives also $MN = +6.6m$.

This is the first of a series of shocks from the Epicentre $5^{\circ}4'N$. $125^{\circ}2'E$. As mentioned in the Introductory Note to this number, the discussion of a series at the Epicentre $46^{\circ}5'N$. $151^{\circ}4'E$. (see the full Note following Sept. 7d. 17h.) the repetitions seem to fit in with Dr. Jeans' suggestion of returns to the epicentre of surface waves which complete the circuit of the earth in $t_1 = 125.8min.$, and $t_2 = 222.0min.$ respectively. But some difficulties of detail arise in interpretation. This first shock on Aug. 11 was clearly small, and was not followed by any other (recorded) for nearly three days. A far more notable shock was that of Aug. 15.52.50. There is no difficulty in representing the first four shocks (three repetitions) by multiples of t_1 and t_2 , as below, but difficulties begin with Nos. 5, 6, and 7.

No.	Dates.	Interval from No. 1	Multiples t_1 t_2	Resid.
1	1918 Aug. 11.9778	.0000	0 0	.0000
2	{ 14.3868	2.4090	{ 24 2	+ .0041
3	{ .3875	2.4097	{	+ .0048
4	15.1097	3.1319	27 5	-.0022
(Large)	15.5250	3.5472	30 6	+ .0014
5	15.5418	3.5640	39 1	+ .0028
6	15.6431	3.6653	19 13	+ .0015
7	15.7292	3.7514	20 13	.0000
8	15.7646	3.7868	31 7	-.0006

The first interval is so large that it may not be significant; but No. 3 follows No. 2 by $3t_1 + 3t_2$, and No. 4 (the big shock) follows No. 3 by $3t_1 + t_2$.

We can perhaps see some reason for No. 4 being large; for since $30t_1 - 17t_2$ the combination $30t_1 + 6t_2 = 23t_2$, so that two sets of waves arrive simultaneously at the epicentre. The matters left in doubt are why there was no result after $30t_1$, combined with multiples of t_2 less than 6, and generally why so long an interval as $24t_1 + 2t_2$ elapsed before anything more happened. But on coming to Nos. 5, 6, and 7 we get more serious difficulties. These shocks do not follow No. 4 after intervals of the form $mt_1 + nt_2$. We cannot represent them in this form without recurring to No. 1 as starting point; and it seems odd that, in the case of No. 5 for instance, 38 intervals of t_1 should elapse without noticeable result, and the 39th produce a shock. Of course, we could write $39t_1 + t_2 = 9t_1 + 18t_2$, but this only alters the difficulty in detail.

An explanation may perhaps be suggested as follows: Waves of the first type will converge to the antiepicentre in time $t_1/2$. If then they can* return to the epicentre as waves of the other type, the whole time of return is $(t_1 + t_2)/2 = .1208day = m$ say. Now No. 6 follows No. 4 (the big shock) by .1181 day, which only differs from m by .0027 day. No. 7 follows No. 6 by t_1 , which offers no difficulty; and No. 8 follows No. 4 by $(t_1 + t_2)$. It is perhaps noteworthy that the intervals $(t_1 + t_2)$ and $(t_1 + t_2)/2$ allow of the concurrence of two sets of waves, one set starting as type 1 succeeded by type 2, the other type 2 succeeded by type 1; and this concurrence must increase the effect.

*At present Dr. Jeans finds theoretical objections to this supposition, which is therefore given very tentatively.

But No. 5 in the list is still unexplained. It clearly cannot follow from No. 4, the interval being too short. But it follows No. 3 at an interval

$$\cdot 4321 = \cdot 1203 + \cdot 3083 + \cdot 0030 = m + 2t_2 + \cdot 0030.$$

We can thus represent the series as below, starting from No. 3 as zero to avoid the big multiples introduced by No. 1.

No.	Date.	Interval from 3	Multiples			Resid.
			t_1	t_2	m .	
3	15.1097	·0000	0	0	0	·0000
4	15.5250	·4153	3	1	0	— ·0010
5	15.5418	·4321	0	2	1	+ ·0030
6	15.6431	·5334	3	1	1	— ·0037
7	15.7292	·6195	4	1	1	— ·0049
8	15.7646	·6549	4	2	0	— ·0029
9	15.8375	·7278	3	3	0	+ ·0042
10	15.8563	·7466	5	2	0	+ ·0015
11	15.9465	·8368	6	2	0	+ ·0043
12	15.9730	·8633	5	2	1	— ·0026
13	15.9861	·8764	0	3	0	— ·0014
14	16.1426	1.0329	0	4	0	+ ·0009
15	16.3579	1.2482	9	3	0	— ·0006
16	16.3925	1.2828	2	7	0	— ·0057
			13	1	0	— ·0071
			6	5	0	— ·0122
			29	4	0	— ·0059
17	18.2540	3.1443	22	8	0	— ·0111
			13	13	0	+ ·0044
			6	17	0	— ·0008
18	19.7271	4.6174				
19	19.9986	4.8889				
20	21.0127	5.9030				

It will be seen that as we get later in the series different alternatives present themselves. They are not, however, exclusive—quite the contrary. There seems to be no good reason why they should not reinforce one another. And something of the same kind is true earlier in the series.

$$\begin{aligned}
 \text{Thus No. 12} &= \text{No. 3} + 5t_1 + 2t_2 + m \\
 &= \text{No. 4} + 2t_1 + t_2 + m \\
 &= \text{No. 5} + 3t_1 \\
 &= \text{No. 6} + 2t_1 + t_2 \\
 &= \text{No. 7} + t_1 + t_2 \\
 &= \text{No. 8} + t_1 + m \\
 &= \text{No. 10} + m
 \end{aligned}$$

But No. 12 cannot be regarded as partly due to No. 9. On the other hand, No. 13 can only be referred to Nos. 3 and 5.

For 18, 19, 20 the alternatives are so numerous that it seemed unnecessary to specify them.

Aug. 11d. Records also at 1h. (Rocca di Papa), 17h. (Algiers), 20h. (Lick).

Aug. 12d. 4h. 58m. 13s. Epicentre at $8^\circ 0'S$. $105^\circ 0'E$.

$$A = -.256, B = +.956, C = -.139; \quad D = +.966, E = +.259; \\ G = +.036, H = -.134, K = -.990.$$

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	2.6	45	10 36	— 5	11 3	— 9	—	2.1
Manila	27.6	35	6 3	— 1	—	—	—	11.2
Colombo	29.2	299	16 17	?L	—	—	(16.3)	—
Kodaikanal	32.9	303	18 35	?L	—	—	(18.6)	—
Sydney	49.7	128	28 59	?	—	—	31.5	33.6
Helwan	80.1	302	44 47	?L	—	—	(44.8)	—
De Bilt	E. 102.3	322	—	—	e 24 19	—119	58.3	63.1
	N. 102.3	322	—	—	—	—	55.3	61.3

Additional record: Manila gives $MN = +11.7m$.

Aug. 13d. 20h. 0m. 50s. Epicentre at $45^{\circ}5'N$. $15^{\circ}0'E$. (as on 1916 July 14d. 20h.).

$$A = +.677, B = +.181, C = +.713.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	s.	s.	s.	s.	s.	s.
Zagreb	0.8	i 14	+ 2	i 24	+ 2	(i 34)	44
Pola	1.0	e 14	- 1	(e 27)	- 1	e 27	29
Zurich	4.8	e 72	- 2	128	- 3	—	—
Zurich v.	4.8	e 71	- 3	129	- 2	—	—

Additional records : Zagreb gives MNW = +46s. and records L as S. Pola MN = +30s.

Aug. 13d. Records also at 0h. (San Fernando), 1h. (La Paz, Tokyo, and Rocca di Papa), 4h. (San Fernando), 7h. (La Paz), 10h. (San Fernando), 15h. (Zagreb, Athens, and Rocca di Papa), 23h. (Tokyo).

Aug. 14d. 13h. 19m. 28s. Epicentre $36^{\circ}0'N$. $21^{\circ}0'E$.

$$A = +.755, B = +.290, C = +.588; \quad D = +.358, E = -.934; \\ G = +.549, H = +.211, K = -.809.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	2.9	62	e 0 47	+ 2	1 23	+ 3	1.5	1.5
Pompeii	6.9	315	e 2 18	+33	—	—	—	—
Rocca di Papa	8.6	314	2 2	- 8	—	—	—	3.9
Pola	10.4	330	e 4 44	?S	(e 4 44)	+ 4	e 6.1	7.0
Triest	11.1	333	e 5 2	?S	(e 5 2)	+ 5	—	—
Graz	11.8	341	—	—	—	—	6.5	—
Zurich	14.6	325	e 3 24	-10	—	—	—	—
De Bilt	19.6	330	—	—	—	—	e 11.0	—

Rocca di Papa gives MN = +5.2m.

Aug. 14d. Records also at 2h. (Zi-ka-wei and San Fernando), 3h. (De Bilt), 9h. (Manila (2)), 14h. (Kodaikanal), 17h. (Kodaikanal), 18h. (Kodaikanal, Tokyo, and Harvard), 20h. (Harvard), 21h. (De Bilt).

1918. Aug. 15d. 12h. 17m. 55s. Epicentre $5^{\circ}4'N$. $125^{\circ}2'E$.

(as on 1918 Aug. 11d. 23h.)

$$A = -.574, B = +.813, C = +.094; \quad D = +.817, E = +.576; \\ G = -.054, H = +.077, K = -.996.$$

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	M. S.	S.	M. S.	S.	M.	M.
Manila	W.	10.1	336	e 2 33	+ 2	—	—	—	—
Hokoto	O.	18.9	344	e 4 32	+ 4	—	—	6.2	7.0
Taihoku	O.	19.9	350	4 47	+ 7	6 22	-119	9.1	20.4
Batavia	W.	21.7	238	4 58	- 3	6 48	-131	—	9.1
Zi-ka-wei	—	26.0	353	e 5 48	0	e 10 58	+36	—	12.9
Kobe	O.	30.7	16	e 6 24	-11	—	—	14.4	18.9
Osaka	O.	30.8	17	e 33	- 3	12 21	+33	14.6	15.4
Tokyo	O.	33.1	22	e 7 7	+10	e 9 38?	-168	15.6?	—
Mizusawa	O.	36.6	21	7 16	-11	12 56	-22	—	—
Perth	M.	38.4	192	7 50	+ 9	—	—	—	—
Calcutta	R. N.	39.5	299	7 29	-22	13 53	- 6	19.0	—
	O. E.	39.5	299	7 35	-16	13 47	-12	20.0	32.0
Adelaide	M.	42.3	163	e 25	+12	14 50	+11	21.6	25.6
Ootomari	O.	43.9	17	e 39	+14	(15 39)	+38	15.6	16.8
Colombo	M.	45.2	274	(9 35)	+61	(14 5)	-73	14.1	38.1
Riverview	—	46.3	150	e 8 35	- 7	i 15 43	+11	e 22.5	31.1
Sydney	M.	46.3	150	e 35	- 7	15 29	- 3	22.6	—
Melbourne	M.	46.9	159	(9 17)	+31	(16 17)	+37	16.3	20.1
Kodaikanal	M.	47.5	277	e 5	-46	14 23	-85	14.4	35.1
Dehra Dun	O.	50.8	305	8 5	-67	—	—	—	—
Simla	O. E.	51.8	306	9 17	- 2	16 41	0	—	—
Bombay	O. E.	52.8	290	9 3	-22	16 35	-19	—	—
Apia	W.	65.4	108	11 12	+25	20 14	+44	33.1	34.1

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Honolulu	M.	75.8	69	12 17	+23	22 23	+48	36.1	45.1
Sitka	B.O.	90.5	31	e 14 20	+61	24 28	+9	e 37.2	40.0
Helwan	M.	90.7	298	12 35	-45	—	—	—	64.6?
Lemberg	B.O.	93.0	321	e 13 23	-9	23 59	-46	44.3	65.5
Athens	—	95.7	309	e 14 40	+53	e 25 0	-13	42.6	62.9
Budapest	—	96.7	319	14 5	+12	26 5	-42	—	—
Vienna	—	98.2	320	13 49	-12	23 5	-153	—	—
Zagreb	W.	99.3	318	e 13 57	-10	i 25 14	-35	53.6	68.1
Victoria	M.	99.9	39	14 23	+13	25 41	-14	37.5	65.5
	Z.	99.9	39	14 23	+13	26 35	+40	46.6	48.4
Triest	W.	100.8	318	16 5	+111	25 41	-22	—	—
Pola	W.	100.9	318	e 18 17	? PR ₁	e 29 25	?	e 49.8	69.5
Pompeii	O.A.	101.9	314	e 14 18	-2	e 30 18	?	52.3	71.3
Monte Cassino	—	102.1	315	14 45	+24	—	—	—	—
Hohenheim	—	102.5	323	13 35	-48	26 24	+4	—	—
Rocca di Papa	Ag.	102.8	315	e 14 23	-1	22 52?	?	e 52.6	68.9
				e 14 38	+14	20 43?	?	53.9	68.6
De Bilt	—	103.4	327	e 14 21	-6	e 26 10	-18	e 47.1	69.4
Zurich	—	103.5	321	e 14 31	+3	—	—	—	—
Milan	—	103.8	319	15 44	+75	19 28?	? PR ₁	51.1	62.1
Berkeley	—	104.0	49	e 14 28	-2	e 25 24	-69	—	51.5
Dyce	Ma.	104.3	333	18 45	? PR ₁	26 45	+9	44.8	69.2
Uccle	—	104.4	326	e 14 17	-15	e 25 5	-92	e 49.1	67.9
Lick	W.	104.7	50	e 19 33	? PR ₁	—	—	—	68.5
Moncalieri	S.	105.0	320	14 36	+2	26 26	-16	36.8	71.4
Besançon	—	105.2	322	19 5	? PR ₁	—	—	—	—
Edinburgh	M.	105.6	332	14 35	-2	—	—	—	68.1
Eskdalemuir	G.	105.9	331	14 35	-4	—	—	—	—
Stonyhurst	M.	106.4	330	e 12 11	-150	e 15 35	?	i 29.5	66.9
Paris	—	106.5	325	e 14 41	-1	e 25 12	-105	51.1	54.1
Kew	M.	106.6	328	18 5	? PR ₁	—	—	—	73.1
Cape Town	M.	106.9	236	18 47	? PR ₁	25 17	-103	28.6	65.3
Bidston	M.S.	107.0	331	18 59	? PR ₁	26 23	-38	—	54.1
Marseilles	Ma.	107.2	317	19 5	? PR ₁	29 30	+147	53.1	67.7
Shide	—	107.6	326	15 8	-22	26 57	-9	53.0	69.3
Barcelona	—	110.1	318	e 18 58	? PR ₁	35 20?	? SR ₁	47.3	68.8
Algiers	B.M.	111.6	313	e 19 15	? PR ₁	29 15	+93	—	60.1
Tortosa	—	111.6	318	18 23	? PR ₁	27 17	-25	53.1	69.1
Tucson	E. B.O.	114.8	50	20 35	? PR ₁	30 28	+140	56.7	68.6
	N. B.O.	114.8	50	21 45	?	30 31	+143	58.4	89.5
	W.	115.5	41	—	—	—	—	55.1	—
Denver	—	116.1	316	e 19 5	? PR ₁	e 31 47	?	—	—
Granada	—	117.7	322	e 18 34	? PR ₁	27 54	-38	40.1	65.8
Coimbra	M.	117.8	318	16 5	+32	—	—	—	73.1
Rio Tinto	—	118.3	317	15 5	-30	29 35	+59	66.1	79.1
San Fernando	M.	124.4	279	30 25	? S	(30 25)	+63	—	58.1
Accra	W.	125.1	34	e 20 53	? PR ₁	e 28 11	-76	61.1	64.1
St. Louis	W.	125.6	26	20 53	? PR ₁	—	—	38.7	56.1
Ann Arbor	E. W.	125.6	26	19 59	? PR ₁	28 11	-79	39.0	56.1
	N. B.	125.6	26	20 53	? PR ₁	—	—	40.2	42.1
	N. B.	125.6	26	20 41	? PR ₁	28 41	-49	38.2	39.4
Ottawa	—	125.8	18	19 25	+17	27 17	-135	38.1	—
Toronto	M.	126.2	22	19 35?	+27	i 37 17	? SR ₁	40.1	81.7
Northfield	B.O.	127.9	16	e 20 35	? PR ₁	—	—	e 38.6	—
Ithaca	B.O.	128.3	20	21 29	? PR ₁	29 11	-38	55.2	—
Tacubaya	—	129.7	60	19 18	[0]	—	—	—	63.5
Harvard	B.O.	130.0	16	17 49	?	24 48	?	34.4	40.1
Washington	Mar.	131.1	23	19 32	+11	26 30	?	e 32.1	—
Georgetown	—	131.1	23	19 44	+23	26 36	?	e 32.5	76.2
Cheltenham	B.O.	131.3	23	19 40	+18	—	—	40.1	84.0
Cipolletti	M.	144.3	162	20 23	+36	21 41	?	—	99.9
Balboa Heights	B.O.	151.4	60	20 16	+18	31 15	-49	72.2	82.4
Pilar	M.	152.4	163	20 23	+24	27 35	?	47.4	104.4
Vieques	B.O.	154.2	24	21 8	+67	27 45	?	e 64.3	81.3
Andalgala	M.	155.2	155	19 53	-9	21 53	?	—	81.9
Rio de Janeiro	B.O.	159.2	212	e 21 47	+100	33 59	?	56.4	96.6
La Quiaca	M.	160.2	149	19 53	-15	29 53	?	—	62.9
La Paz	Bi.	162.8	131	20 24	+14	34 18	?	66.2	80.2

For Notes see next page.

NOTES TO AUG. 15d. 12h. 17m. 55s.

Additional records: Hokoto gives another shock with $L = +9.6m.$ and $M = +9.9m.$; it seems probable that these really apply to this shock and the L and M of the text to an earlier one, which may explain the negative residuals for S at Taihoku, Batavia, and Tokyo. Zi-ka-wei $PR_N = +6m.38s.$, $PRE = +6m.48s.$, $MN = -12.2m.$ Kobe $MN = +19.7m.$ Osaka $MN = +16.2m.$ Adelaide $PR_1 = +10m.5s.$, $SR_1 = +18m.10s.$, $M = +27.5m.$ Riverview $i = +8m.54s.$, and $+9m.5s.$, $iPR_1 = +10m.42s.$, $iPR_2 = +11m.1s.$, $iPS = +16m.18s.$, $iSR_1 = +18m.25s.$, $iSR_2 = +19m.38s.$, $MN = +31.4m.$ Sydney $PR_2 = +10m.53s.$ Melbourne $SR_1 = +12m.35s.$, $SR_2 = +13m.29s.$ Kodaikanal records its P as at 18h. Apia $i_1 = +12m.4s.$, $i_2 = +12m.22s.$, $i = +21m.32s.$, $M = +35.1m.$ Helwan gives M one hour too early. Lem-berg $ePR_1 = +17m.29s.$ Athens $MN = +58.7m.$ Zagreb $iPR_1 = +17m.46s.$, $iPR_2 = +20m.43s.$, $iPR_3 = +22m.15s.$, $MNW = +65.1m.$ Victoria $L = -40.4m.$, $SZ = -26m.35s.$, $LZ = +46.6m.$, $MZ = -48.4m.$ Pola $MN = +71.2m.$ Rocca di Papa $L = -59.9m.$, $-56.5m.$, and $+62.9m.$ De Bilt $eE = +13m.23s.$, $ePR_1 = +18m.50s.$, $eE = +28m.48s.$, and $+31m.0s.$, $eN = +34m.2s.$, and $+42m.18s.$, $MN = +55.9m.$ Epicentre $5^\circ.5'N$, $124^\circ.5'E$. Berkeley $MN = +50.8m.$, $MV = +51^\circ.0m.$, $T_0 = +12h.19m.23s.$ Dyce $c = -19m.17s.$ Uccle $c = -18m.5s.$, $M_0Z = -68.7m.$ Lick $MN = +51.4m.$ Moncalieri $MN = +70.8m.$ Stonyhurst $M = +78.6m.$ Paris $PR_1 = +19m.29s.$, $i_1 = +26m.1s.$, $i_2 = +27m.22s.$ Marseilles $MN = +86.8m.$ Shide $PR_1 = +19m.21s.$ Barcelona $LN = +46.3m.$, $M = +72.1m.$ Algiers $i = +20m.7s.$ Coimbra $PR_1 = +21m.51s.$, $PR_2 = +23m.32s.$, $PR_3N = +23m.33s.$, $SR_1E = +30m.3s.$, $SR_1N = +30m.9s.$, $LN = +42.6m.$, $MN = +70.0m.$ San Fernando $MN = +81.1m.$ St. Louis $eSE = +28m.17s.$, $eL = +34.2m.$ Ottawa $L = +59.1m.$, $T_0 = 12h.27m.32s.$ Toronto $PE = +21m.53s.$, $i = +27m.47s.$, and $+33m.29s.$, $L = +44.2m.$, $iL = +69.4m.$, and $+77.2m.$ Ithaca $eN = +23m.20s.$, $+24m.29s.$, $+32m.11s.$, $+34m.32s.$, and $+39m.33s.$, $eE = +39m.15s.$, $LN = +57.3m.$ Harvard $i = +20m.1s.$, and $+20m.12s.$, $T_0 = 12h.26m.21s.$ Washington $L = +40.1m.$ and $+65.1m.$ Georgetown $MN = +92.2m.$ Andalgalá $MN = +99.5m.$, $ME = +96.9m.$ Rio de Janeiro $LN = +56.5m.$, $MN = +91.1m.$ La Quiaca $M = +93.4m.$ La Paz $PR_1E = +21m.37s.$, $PR_1N = +21m.44s.$, $PR_2N = +27m.19s.$, $PR_2E = +27m.27s.$, $SR_1N = +36m.13s.$, $SR_1E = +36m.15s.$, $SR_2E = +40m.9s.$, $SR_2N = +40m.24s.$, $IE = +46m.9s.$ and $+48m.37s.$, $iN = +48m.53s.$, $LN = +64.6m.$

Aug. 15d. 15h. 26m. 0s. Epicentre $5^\circ.4'N$, $125^\circ.2'E$. (as at 12h.).

$A = -574$, $B = +813$, $C = +094$; $D = +817$, $E = +576$;
 $G = -054$, $H = +077$, $K = -996$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	10.1	336	e 2 40	+ 9	—	—	—	—
Batavia	21.7	238	e 5 0	- 1	—	—	—	9.0
Zi-ka-wei	26.0	353	e 5 51	+ 3	10 26	+ 4	—	—
Kobe	30.7	16	e 7 36	+61	—	—	15.9	16.8
Osaka	30.8	17	7 27	+51	13 10	-82	15.8	21.0
Mizusawa	E. 36.6	21	7 27	0	13 11	- 7	—	—
	N. 36.6	21	7 30	- 3	13 8	-10	—	—
Adelaide	42.3	163	8 0	-13	—	—	—	19.0
Riverview	46.3	150	e 9 1	+19	e 15 30?	- 2	—	30.0
Zagreb	99.3	318	e 14 0	- 7	—	—	—	—
Rocca di Papa	102.8	315	—	—	—	—	41.8	65.3
De Bilt	103.4	327	—	—	—	—	—	56.2
Uccle	104.4	326	—	—	—	—	e 43.0	59.0
La Paz	162.8	131	19 33	[-37]	33 12	?	83.0	88.9

Osaka gives $MN = +17.9m.$ Riverview $MN = +29.4m.$ De Bilt $M = +58.3m.$

1918. Aug. 15d. 17h. 30m. 5s. Epicentre 5°4N. 125°2'E.

A = -574, B = +813, C = +094; D = +817, E = +576;

G = -054, H = +077, K = -996.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	10.1	336	e 2 38	+ 7	—	—	—	—
Taihoku	19.9	350	e 4 38	+ 2	(8 23)	+ 2	8.4	13.0
Batavia	21.7	238	i 5 2	+ 1	9 2	+ 3	—	11.9
Zi-ka-wei	26.0	353	e 5 50	+ 2	e 10 17	- 5	—	16.1
Kobe	30.7	16	e 6 20	- 15	—	—	—	—
Osaka	30.8	17	7 4	+28	12 16	+28	14.5	15.3
Tokyo	33.1	22	e 7 3	+ 6	—	—	—	—
Mizusawa	E. 36.6	21	7 8	-19	12 52	-26	—	—
	N. 36.6	21	7 10	-17	12 48	-30	—	—
Perth	38.4	192	10 42	+181	13 37	- 7	16.2	18.0
Calcutta	39.5	299	7 37	-14	13 37	-22	—	—
Adelaide	42.3	163	—	—	13 55	-44	21.9	26.2
Ootomari	43.9	17	8 37	+12	—	—	—	—
Colombo	45.2	274	(8 37)	+ 3	(15 25)	+ 7	15.4	31.4
Riverview	46.3	150	e 8 33	- 9	i 15 25	- 7	e 22.6	29.0
Melbourne	46.9	159	—	—	15 49	+ 9	19.1	19.9
Simla	51.8	306	9 19	0	16 25	-16	—	28.9
Bombay	52.8	290	9 27	+ 2	—	—	—	35.9
Honolulu	75.8	69	12 7	+13	21 31	- 4	35.0	49.9
Lemberg	93.0	321	17 19	?PR ₁	24 19	-26	53.9	57.6
Athens	95.7	309	e 17 29	?PR ₁	23 59?	-74	e 53.9	—
Budapest	96.7	319	—	—	e 24 55	-28	—	—
Vienna	98.2	320	17 49	?PR ₁	26 55	+79	—	—
Zagreb	99.3	318	e 13 49	-18	—	—	52.9	64.9
Victoria	99.9	39	25 49	?S	(25 49)	- 6	47.0	72.5
Pola	100.9	318	e 18 17	?PR ₁	e 24 53	-71	e 32.7	63.7
Hohenheim	102.5	323	17 57	?PR ₁	25 51	-29	—	—
Rocca di Papa	102.8	315	18 27	?PR ₁	e 26 14	- 8	e 56.7	64.9
De Bilt	E. 103.4	327	(e 18 32)	?PR ₁	e 24 44	-104	e 49.9	54.1
	N. 103.4	327	(e 18 39)	?PR ₁	e 25 50	-38	e 51.9	64.0
Berkeley	104.0	49	—	—	—	—	e 46.9	—
Uccle	104.4	326	e 17 55	?PR ₁	—	—	e 50.9	62.9
Moncalieri	105.0	320	e 12 23?	? ?	i 28 0	+78	40.0	65.2
Eskdalemuir	105.9	331	e 24 55	? ?	—	—	—	56.2
Paris	106.5	325	e 18 18	?PR ₁	i 29 19	? ?	51.9	56.9
Kew	106.6	328	—	—	—	—	—	61.9
Capetown	106.9	236	25 7	? ?	31 7	? ?	—	65.1
Bidston	107.0	331	27 13	?S	(27 13)	+12	—	53.3
Barcelona	110.1	318	18 52	?PR ₁	28 50	? ?	39.7	64.5
Algiers	111.6	313	e 19 25	?PR ₁	29 7	? ?	45.9	69.9
Tortosa	111.6	318	19 8	?PR ₁	27 48	+ 6	56.1	67.6
Granada	116.1	316	20 19	?PR ₁	e 33 5	? ?	—	—
Coimbra	117.7	322	19 49	?PR ₁	29 57	? ?	57.4	65.5
San Fernando	118.3	317	29 55	? ?	—	—	—	82.9
Ottawa	125.8	18	i 21 3	?PR ₁	i 37 55	?SR ₂	59.9	—
Toronto	126.2	22	(21 49)	?PR ₁	—	—	86.9	89.0
Ithaca	128.3	20	—	—	e 37 45	?SR ₁	e 53.9	—
Harvard	130.0	16	—	—	40 45?	?SR ₁	60.2	69.8?
Washington	131.1	23	e 21 32	?PR ₁	22 40	? ?	40.4	—
Georgetown	E. 131.1	23	e 20 55	?PR ₁	23 11	? ?	e 39.2	—
Georgetown	N. 131.1	23	e 20 55	?PR ₁	23 6	? ?	e 39.1	—
Cheltenham	131.3	23	22 45	?PR ₁	—	—	—	—
La Paz	162.8	131	e 20 19	[+ 9]	34 6	? ?	75.3	81.2

Additional records : Taihoku gives M = +9.1m. Zi-ka-wei ePN = +5m.38s.,
 PMN = +5m.54s., SME = +10m.36s., SMN = +11m.2s. Osaka MN = +
 +20.3m. Adelaide SR₁ = +16m.55s. Colombo gives P as S and S as
 L. Riverview PR₁ = +10m.26s., eS = +15m.16s., iSR₁ = +18m.29s.,
 MN = +30.0m., MZ = +30.2m. Zagreb iPR₁ = +18m.2s., MNW =
 +69.9m. Victoria S = +36m.42s. Rocca di Papa L = +72.7m.
 De Bilt eN = +33m.9s., eE = +33m.18s., eN = +43m.30s. Uccle MN =
 +61.9m. Moncalieri i = +18m.49s., MN = +70.4m. Eskdalemuir MN
 = +56.4m. Barcelona MN = +62.2m. Coimbra PR₁N = +22m.46s.,
 MN = +77.0m. San Fernando MN = +79.9m. Ottawa i = +26m.25s.,
 eLE? = +50.9m., L = +69.9m., and +74.9m. Toronto L = +42.9m.
 Harvard LN = +60.8m., T₀ = 17h.48m.24s? Cheltenham PN = +
 22m.48s.

Aug. 15d. Records also at 0h. (San Fernando), 2h. (Manila), 5h. (Dehra Dun), 13h. (Batavia, Hokoto, and Manila), 15h. (La Paz (2)), 18h. (Batavia and Pompeii), 19h. (Manila), 20h. (Batavia (2), Manila (2), and Colombo), 21h. (Mizusawa and De Bilt), 22h. (Manila), 23h. (Manila (2) and Lick).

Aug. 16d. 3h. 23m. 23s. Epicentre $5^{\circ}4'N$. $125^{\circ}2'E$. (as on Aug. 15d. 12h. and 15h.)

A = -0.574, B = +0.813, C = +0.094; D = +0.817, E = +0.576;
G = -0.054, H = +0.077, K = -0.996.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Manila	10.1	336	e 2 45	+14	4 25	- 7	5.5	7.4
Taihoku	19.9	350	3 5	-95	(8 0)	-21	8.0	8.7
Batavia	21.7	238	e 5 0	- 1	—	—	—	11.6
Zi-ka-wei	26.0	353	5 42	- 6	e 10 21	- 1	e 12.9	15.9
Kobe	30.7	16	e 6 11	-24	—	—	14.8	21.1
Osaka	30.8	17	6 43	+ 7	12 10	+22	15.2	19.4
Perth	38.4	192	8 1	+20	13 36	- 8	—	—
Adelaide	42.3	163	—	—	14 32	- 7	24.3	26.5
Colombo	45.2	274	15 1	?S	(15 1)	-17	—	38.1
Sydney	46.3	150	15 25	?S	(15 25)	- 7	27.1	29.1
Riverview	46.3	150	e 8 38	- 4	e 15 27	- 5	e 24.7	30.7
Melbourne	46.9	159	—	—	(15 49)	+ 9	15.8	21.9
Kodaikanal	47.5	277	15 49	?S	(15 49)	+ 1	30.1	33.0
Simla	51.8	306	—	—	e 16 49	+ 8	—	—
Helwan	90.7	298	14 37	+87	—	—	—	—
Zagreb	99.3	318	e 17 37	?PR ₁	—	—	50.6	—
Triest	100.8	318	—	—	—	—	e 52.6	—
Pompeii	101.9	314	e 25 13	?S	(e 25 13)	-61	—	—
Rocca di Papa	102.8	315	e 19 48	?PR ₁	—	—	—	33.3
De Bilt	103.4	327	—	—	e 25 53	-35	e 51.6	56.5
Uccle	104.4	326	—	—	—	—	e 54.6	—
Moncalieri	105.0	320	e 18 30	?PR ₁	29 17	?	57.7	—
Edinburgh	105.6	332	31 37	?	—	—	—	73.6
Eskdalemuir	105.9	331	e 23 25	?	—	—	49.6	—
Kew	106.6	328	—	—	—	—	—	66.6
Barcelona	110.1	318	e 25 36	?	—	—	—	—
Algiers	111.6	313	—	—	—	—	74.6	—
Coimbra	117.7	322	—	—	—	—	e 59.6	—
La Paz	162.8	131	21 8	[+58]	—	—	45.0	46.3

Additional records: Manila gives MN = +5.8m. Zi-ka-wei SMN = +10m.50s. Osaka MN = +20.2m. Adelaide SR₁ = +17m.42s. Riverview ePR₁ = +10m.43s. eSR₂ = +18m.49s. and +19m.16s. MZ = +30.8m., MN₁ = +31.0m. Rocca di Papa eP = +18m.12s., i = +66m.19s. De Bilt eE = +21m.32s., eN = 23m.21s., eLN = +53.6m., MN = +63.0m. Edinburgh records P as at 0h. instead of 3h. La Paz M = +49.0m.

Aug. 16d. 7h. 22m. 20s. Epicentre at $9^{\circ}0'N$. $110^{\circ}0'E$.

A = -0.338, B = +0.928, C = +0.156; D = +0.940, E = +0.342;
G = -0.054, H = +0.147, K = -0.988.

The active epicentre $5^{\circ}4'N$. $125^{\circ}2'E$. does not fit the observations.

	Δ °	Az. °	P. m. s.	O - C. s.	L. m.	M. m.
Manila	12.1	62	e 3 2	+ 2	5.9	—
Batavia	15.5	192	e 3 40	- 6	—	9.7
Taihoku	19.4	33	e 4 48	+14	—	—
Zi-ka-wei	24.7	24	e 5 35	0	—	—
Osaka	34.7	38	8 41	?PR ₁	—	22.9
Helwan	75.8	299	24 40	?	—	—

Osaka gives MN = +20.8m.

1918. Aug. 16d. 8h. 35m. 25s. Epicentre 5°·4N. 125°·2E.

A = -·574, B = +·813, C = +·094; D = +·817, E = +·576;
G = -·054, H = +·077, K = -·996.

There are advantages in keeping the same adopted epicentre as on Aug. 11, 15, &c., but the residuals point to an epicentre further north.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Manila	10·1	336	e 2 52	+21	—	—	4·6	6·8
Taihoku	19·9	350	4 25	-15	8 11	-10	11·0	13·2
Batavia	21·7	238	5 8	+7	—	—	—	9·6
Zi-ka-wei	26·0	353	5 44	-4	i 10 16	-6	e 14·7	16·2
Kobe	30·7	16	6 51	+16	—	—	16·2	17·4
Osaka	30·8	17	6 39	+3	11 42	-6	14·8	27·6
Perth	38·4	192	13 58	?S	(13 58)	+14	—	—
Colombo	45·2	274	14 35	?S	(14 35)	-43	—	18·6
Riverview	46·3	150	i 8 57	+15	e 16 9	+37	e 23·9	29·8
Sydney	46·3	150	15 53	?S	(15 53)	+21	27·6	30·2
Melbourne	46·9	159	—	—	16 5	+25	19·7	22·3
Kodaikanal	47·5	277	15 59	?S	(15 59)	+11	19·9	36·5
Simla	51·8	306	—	—	e 16 5	-36	—	35·9
Vienna	98·2	320	—	—	—	—	e 61·6	—
Zagreb	99·3	318	e 15 35	+88	—	—	51·6	—
Victoria	99·9	39	—	—	—	—	47·2	63·4
Triest	100·8	318	—	—	—	—	e 55·6	—
Rocca di Papa	102·8	315	e 17 36	?PR ₁	—	—	—	19·4
De Bilt	103·4	327	—	—	e 24 52	-96	e 51·6	58·1
Uccle	104·4	326	—	—	—	—	e 53·6	58·6
Moncalieri	105·0	320	e 14 30?	-4	24 57?	-105	43·4	—
Eskdalemuir	105·9	331	e 26 20	?S	(e 26 20)	-31	52·1	—
Paris	106·5	325	—	—	—	—	e 58·6	68·6
Kew	106·6	328	59 35	?L	—	—	(59·6)	71·6
Capetown	106·9	236	57 23	?L	—	—	(57·4)	64·3
Bidston	107·0	331	60 5	?L	—	—	(60·1)	71·2
Barcelona	110·1	318	—	—	—	—	61·0	71·8
Algiers	111·6	313	—	—	—	—	69·6	—
Coimbra	117·7	322	—	—	—	—	e 63·6	—
San Fernando	118·3	317	45 35	?	—	—	—	77·6
Toronto	126·2	22	—	—	—	—	45·3	—
La Paz	162·8	131	19 46 [-24]	—	—	—	44·2	92·3

Additional records: Manila gives MN = +6·4m. Zi-ka-wei eSN = +10m.8s. Osaka MN = +17·3m. Riverview eS = +14m.52s., SR₁ = +19m.16s. and +19m.42s., MN₁ = +30·2m., MZ = +31·0m. De Bilt eN = +24m.58s. and +33m.7s., eE = +33m.21s., MN = +58·3m. Paris MN = +63·6m. Barcelona MN = +67·5m. La Paz L = +89·4m.

Aug. 16d. 9h. 25m. 10s. Epicentre 5°·4N. 125°·2N., as at 8h.

A = -·574, B = +·813, C = +·094; D = +·817, E = +·576;
G = -·054, H = +·077, K = -·996.

	Δ °	Az. °	P. m. s.	O - C. s.	M. m.
Manila	10·1	336	e 2 33	+2	—
Batavia	21·7	238	i 4 50	-11	9·8
Zi-ka-wei	26·0	353	e 4 34	-74	—
Osaka	30·8	17	7 28	+52	20·6
Riverview	46·3	150	18 32	?SR ₁	—
Rocca di Papa	102·8	315	e 33 10	?SR ₁	—

Osaka gives MN = +19·3m. Riverview e = +18m.8s.

Aug. 16d. Records also at 0h. (Helwan, Manila, Tokyo, San Fernando, and De Bilt), 1h. (Manila), 2h. (Zagreb and La Paz), 4h. (Zagreb, Batavia, Manila (2), and Rocca di Papa (2)), 5h. (Zagreb), 6h. (Riverview (2)), 8h. (De Bilt, Edinburgh, and San Fernando), 10h. (Zi-ka-wei, Batavia, Manila (2), and De Bilt), 11h. (Manila, Tokyo, and Zi-ka-wei), 15h. (La Paz), 16h. (Batavia, Moncalieri, Manila, Tokyo, Zi-ka-wei, and San Fernando), 17h. (Helwan, Edinburgh, and De Bilt), 20h. (Rocca di Papa and Monte Cassino), 22h. (Manila and Lick).

1918. Aug. 17d. 6h. 53m. 28s. Epicentre 18°·5S. 63°·5W.

 $\Delta = +.423$, $B = -.849$, $C = -.317$; $D = -.895$, $E = -.446$; $G = -.142$, $H = +.284$, $K = -.948$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Quiaca	4·2	209	2 20	?L	6 20	?	—	8·1
La Paz	4·8	294	i 1 15	+ 1	—	—	2·1	2·6
Andalgala	E. 9·5	195	2 20	- 3	2 56	?PR ₁	—	4·9
	N. 9·5	195	1 56	-27	2 56	?PR ₁	—	3·5
Pilar	E. 13·2	181	5 44	?	6 50	?L	(6·8)	7·9
	N. 13·2	181	5 50	?	6 56	?L	(6·9)	9·0
Georgetown	58·8	348	e 10 1	- 3	18 6	- 3	e 32·0	—
Washington	58·8	348	10 2	- 2	18 6	- 3	e 29·0	—
Ithaca	62·0	349	e 10 27	+ 2	18 47	- 1	34·2	—
Ann Arbor	N. 63·6	343	—	—	18 56	-12	—	—
Toronto	63·8	347	—	—	—	—	38·1	48·2
Ottawa	64·8	351	10 43	- 1	19 27	+ 4	e 31·5	—
San Fernando	N. 77·1	44	44 32	?L	—	—	(44·5)	52·0
	E. 77·1	44	43 32	?L	—	—	(43·5)	51·5
Rio Tinto	77·6	43	17 32	?	—	—	—	49·5
Coimbra	77·9	40	12 27	+21	22 49	+50	40·2	48·6
Algiers	83·6	48	—	—	e 23 6	+ 1	37·5	54·5
Tortosa	83·9	43	12 52	+11	23 40	+32	39·5	48·0
Barcelona	85·2	43	16 33	?PR ₁	—	—	e 46·4	—
Victoria	85·4	325	—	—	—	—	50·2	52·0
Shide	88·0	34	13 10	+ 5	i 24 1	+ 9	47·7	50·7
Bidston	88·6	31	13 14	+ 6	23 14	-45	—	50·5
Kew	89·0	34	—	—	—	—	—	57·5
Stonyhurst	89·1	31	i 22 50	?	e 32 56	?SR ₁	—	49·6
Paris	89·2	37	e 18 2	?PR ₁	i 25 12	+67	46·5	50·5
Eskdalemuir	89·6	30	e 13 19	+ 5	24 12?	+ 2	43·0	—
Edinburgh	90·0	29	23 32	?S	(23 32)	-42	—	—
Moncalieri	90·5	42	e 13 18	- 1	26 5	?	e 41·0	58·1
Uccle	91·1	36	—	—	—	—	e 46·5	—
De Bilt	92·2	35	e 13 41	+13	e 24 13	-24	e 49·1	54·4
Rocca di Papa	92·4	47	e 13 25	- 4	24 12?	-27	—	—
	92·4	47	e 17 31	?PR ₁	23 12?	-87	e 55·1	68·1
Triest	94·6	43	—	—	—	—	e 49·5	—
Zagreb	96·1	44	e 17 32	?PR ₁	—	—	53·5	59·5
Vienna	97·3	41	e 18 2	?PR ₁	—	—	—	—
Honolulu	100·7	289	24 26	?S	(24 26)	-96	44·5	56·0
Helwan	103·2	63	25 50	?S	(25 50)	-36	—	68·7
Melbourne	117·7	205	—	—	—	—	e 54·5	56·5
Riverview	118·1	212	—	—	e 35 49	?	e 51·9	56·4
Kodaikanal	141·4	97	84 32	?L	—	—	(84·5)	—
Simla	142·4	63	58 8	?L	—	—	(58·1)	62·1
Manila	174·2	228	e 20 10	[- 6]	—	—	—	—

Additional records: Georgetown gives $L = +34\cdot8m$, $T_0 = 6h.53m.28s$. Wash-
 ington $L = +34\cdot5m$, $T_0 = 6h.53m.29s$. Ithaca $LN = +35\cdot5m$. Toronto
 $eL = +46\cdot6m$. Ottawa $L = +36\cdot5m$. and $+41\cdot5m$, $T_0 = 6h.53m.27s$.
 San Fernando records PN at 3h. instead of 7h. Coimbra $LN = +38\cdot5m$,
 $T_0 = 6h.53m.31s$. Eskdalemuir $SR_1 = +30m.25s$, $T_0 = 6h.53m.51s$.
 Moncalieri $i = +16m.22s$, $MN = +56\cdot7m$. De Bilt $ePR_1E = +17m.38s$,
 $e = +26m.35s$, $eLN = +50\cdot1m$, $MN = +54\cdot5m$. Zagreb $MNW = +56\cdot5m$.
 Riverview $e = +39m.14s$, $MN = +53\cdot9m$.

Aug. 17d. 10h. 25m. 25s. Epicentre 77°·0S. 110°·0E.?

 $A = -.077$, $B = +.211$, $C = -.974$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Melbourne	42·0	40	—	—	20 11	?L	(20·2)	25·1
Riverview	46·9	43	—	—	e 15 43	+ 3	e 22·6	26·4
La Paz	86·5	183	e 12 58	+ 2	23 32	- 4	38·1	43·0
Osaka	112·8	25	17 11	+121	—	—	—	28·6
Helwan	116·6	290	77 35	?L	—	—	(77·6)	—
San Fernando	131·2	250	79 35	?L	—	—	(79·6)	—
Stonyhurst	146·9	260	—	—	—	—	—	88·7
Edinburgh	149·0	263	82 35	?L	—	—	(82·6)	(109·8)

Additional records: Melbourne $L = +23\cdot6m$. Riverview gives $MN =$
 $+25\cdot3m$. Osaka $MN = +30\cdot3m$. But the Osaka records may
 refer to a different shock.

Aug. 17d. Records also at 3h. (La Paz, Denver, and Manila), 4h. (Manila and Helwan), 8h. (Manila), 12h. (Taihoku and Zi-ka-wei), 16h. (La Paz), 18h. (La Paz, Manila, and Barcelona), 21h. (La Paz).

Aug. 18d. 6h. 4m. 50s. Epicentre $5^{\circ}4'N$. $125^{\circ}2'E$. (as on Aug. 16d. 9h., &c.).

A = -·574, B = +·813, C = +·094; D = +·817, E = +·576;

G = -·054, H = +·077, K = -·996.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	10·1	336	e 2 54	+23	5 5	+33	5·8	7·3
Batavia	21·7	238	e 4 10	-51	—	—	—	10·2
Zi-ka-wei	26·0	353	5 45	-3	e 10 22	0	—	16·0
Osaka	30·8	17	6 37	+1	—	—	—	20·5
Riverview	46·3	150	e 11 34?	+172	e 18 51	+199	e 28·6	35·5
Melbourne	46·9	159	—	—	(15 40)	0	15·7	32·2
Helwan	90·7	298	16 10	?PR ₁	—	—	—	—
Rocca di Papa	102·8	315	—	—	—	—	70·6	—
De Bilt	E. 103·4	327	—	—	—	—	e 52·2	67·2
N. 103·4	327	—	—	—	—	—	e 54·2	60·2
Uccle	104·4	326	—	—	—	—	—	55·2
Edinburgh	105·6	332	54 10	?L	—	—	(54·2)	71·7
Eskdalemuir	105·9	331	—	—	—	—	50·2	—
Paris	106·5	325	—	—	—	—	e 59·2	—
Bidston	107·0	331	62 52	?L	—	—	(62·9)	70·3

Additional records: Zi-ka-wei gives SMN = +10m.56s.
+22m.49s., MN = +30·1m.

Riverview eSR₁ =

Aug. 18d. Records also at 2h. (Mizusawa), 3h. (Manila, Barcelona, and Batavia), 4h. (De Bilt), 8h. (Manila, La Paz, Pilar, Andalgala, and Cipolletti), 9h. (Manila, La Paz, Helwan, and Edinburgh), 13h. (San Fernando), 16h. (Marseilles), 17h. (Zi-ka-wei (2)), 21h. (La Paz), 22h. (Manila).

Aug. 19d. 17h. 27m. 0s. Epicentre $5^{\circ}4'N$. $125^{\circ}2'E$. (as on Aug. 18d. 6h.).

A = -·574, B = +·813, C = +·094; D = +·817, E = +·576;

G = -·054, H = +·077, K = -·996.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	10·1	336	e 3 30	+59	—	—	5·1	6·3
Batavia	21·7	238	e 5 0	-1	—	—	—	12·0
Tokyo	33·1	22	5 39	-78	—	—	—	—
Colombo	45·2	274	30 0	?	—	—	—	—
Riverview	46·3	150	—	—	—	—	e 19·6	31·1
Helwan	90·7	298	25 0	?S	(25 0)	+39	—	—
De Bilt	E. 103·4	327	e 28 28	?	—	—	e 57·0	58·9
N. 103·4	327	—	—	—	—	—	e 55·0	59·0
Edinburgh	105·6	332	54 0	?L	—	—	(54·0)	72·0
Eskdalemuir	105·9	331	—	—	—	—	51·0	—
La Paz	162·8	131	19 26	[-44]	—	—	—	—

Additional records: Manila gives MN = +6·5m.
MN = +31·7m.

Riverview e = +26·6m.,

Aug. 19d. 23h. 57m. 55s. At $5^{\circ}4'N$. $125^{\circ}2'E$. (as at 17h.).

A = -·574, B = +·813, C = +·094; D = +·817, E = +·576;

G = -·054, H = +·077, K = -·996.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	10·1	336	e 2 35	+4	4 21	-11	6·1	6·4
Batavia	21·7	238	e 5 5	+4	—	—	—	10·1
Helwan	90·7	298	59 5	?L	—	—	(59·1)	—
De Bilt	103·4	327	—	—	—	—	e 53·1	57·5
Edinburgh	105·6	332	52 5	?L	—	—	(52·1)	—
Eskdalemuir	105·9	331	—	—	—	—	50·1	—
San Fernando	118·3	317	36 5	?SR ₁	—	—	—	—

De Bilt gives MN = +57·8m.

Aug. 19d. Records also at 0h. (San Fernando), 1h. (Stonyhurst and Manila), 3h. (La Paz), 4h. (Manila), 7h. (Manila and Rio Tinto), 11h. (Berkeley), 12h. (Riverview), 17h. and 18h. (Manila), 21h. (La Paz), 22h. (Helwan).

Aug. 20d. Records at 2h. (Manila, Tokyo, and Osaka), 3h. (La Paz, Tokyo, and De Bilt), 4h. (Athens), 6h. (Tokyo), 7h. (Manila), 12h. (Manila), 13h. (Batavia), 18h. (Lick and Berkeley), 21h. (La Paz), 22h. (San Fernando).

Aug. 21d. 0h. 18m. 15s. Epicentre $5^{\circ}4'N$. $125^{\circ}2'E$. (as on Aug. 19d. 23h.).

$$A = -\cdot574, B = +\cdot813, C = +\cdot094.$$

	Δ °	Az. °	P. m. s.	O-C. s.	L. m.	M. m.
Manila	10.1	336	e 2 38	+ 7	—	—
Batavia	21.7	238	e 4 45	-16	—	—
Riverview	46.3	150	e 21 9	?L	e 25.8	26.5
Helwan	90.7	298	49 45	?L	(49.8)	—
De Bilt	103.4	327	—	—	55.4	61.0
Paris	106.5	325	—	—	62.8	—
La Paz	162.8	131	20 6	[- 4]	—	—

Riverview gives $MN = -29.0m$. De Bilt $MN = +57.8m$.

Aug. 21d. 4h. 12m. 12s. Epicentre $43^{\circ}4'N$. $72^{\circ}0'W$.

$$A = +\cdot224, B = -\cdot691, C = +\cdot687.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Harvard	1.2	0 16	- 2	—	—	—	0.7
Ottawa	3.4	—	—	1 36	+ 2	e 1.8	—
Toronto	5.4	—	—	—	—	2.2	2.4

Harvard gives $T_0 = 4h.11m.54s$. Ottawa $T_0 = 4h.12m.50s$.

Aug. 21d. 12h. 19m. 5s., 12h. 44m. 45s., 13h. 13m. 26s., 13h. 43m. 32s., 17h. 2m. 8s. A series of Tacubaya records, in which P follows these times by 31sec. and M by approximately 78sec., indicate shocks from the same epicentre as on August 22d. 8h.

Aug. 21d. Records also at 7h. (Rio Tinto), 9h. (De Bilt and San Fernando), 11h. (Helwan), 13h. (La Paz), 14h. (Manila), 15h. (Helwan, Lick, and Athens), 17h. and 18h. (Athens), 19h. (La Paz and Athens), 20h. (Batavia), 21h. (Manila and La Paz).

Aug. 22d. 8h. 31m. 0s. At $20^{\circ}0'N$. $99^{\circ}0'W$. (as on 1913 June 14d.).

$$A = -\cdot147, B = -\cdot928, C = +\cdot342; \quad D = -\cdot988, E = +\cdot156; \\ G = -\cdot053, H = -\cdot338, K = -\cdot940.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tacubaya	0.6	202	(0 3)	- 6	—	—	—	(0.8)
Toronto	28.8	30	—	—	(11 18)	+ 5	11.3	—
Ottawa	31.8	32	13 56	?S	(13 56)	+111	—	—
La Paz	47.4	138	8 42	- 8	15 42	- 4	24.3	26.7
Honolulu	54.9	282	—	—	17 48	+28	24.7	29.0

This is one of a series of shocks recorded at Tacubaya on Aug. 21 and 22, in all of which M follows P by about 47sec., and which are probably from the same epicentre close to Tacubaya. But it would seem that there is an error of 2min. in the present case, the actual records giving $P = -1m.57s$. and $M = -0.7m$. The other times for T_0 are

Aug. 22d.	9h. 47m. 52s.	$P = +31s$.	$M = +83s$.
	9h. 57m. 58s.	$P = +31s$.	$M = +82s$.
	11h. 58m. 21s.	$P = +31s$.	$M = +75s$.

but if there is an error of 2min., as above, it may extend to others. The Tacubaya records are given in local time, and the longitude $6h.36m.47s$. has been added in this and other cases. It is assumed that the Toronto L is really S. The Ottawa P may be S (with an error of 2min.) or L. The Honolulu P is assumed to be S.

Aug. 22d. Records also at 1h. (Lick), 15h. (Victoria), 17h. (Zi-ka-wei and Bidston), 19h. (Manila), 20h. (San Fernando and Lick), 22h. (Bidston), 23h. (Manila).

Aug. 23d. 6h. 7m. 30s. Epicentre $10^{\circ}0'S$, $44^{\circ}0'E$.

A = +.708, B = +.684, C = -.174; D = +.695, E = -.719;
G = -.125, H = -.121, K = -.985.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mauritius	N.	16.7	129	3 42	-19	—	—	7.4	8.9
	E.	16.7	129	3 24	-37	—	—	7.9	8.9
Cape Town		33.4	220	11 24	?S	(11 24)	-66	18.9	20.2
Kodaikanal		38.9	60	18 6	?L	—	—	(18.1)	—
Colombo		39.5	66	—	—	17 30	?SR ₁	21.0	53.2
Helwan		41.7	343	13 30	?S	(13 30)	-61	—	—
Simla		52.0	36	e 16 42	?S	e (16 42)	-2	—	53.0
Rocca di Papa		59.2	333	(e 10 5)	-1	e 10 5	?P	e 39.3	40.4
Algiers		60.6	323	—	—	—	—	30.5	40.5
Zagreb		61.2	338	—	—	e 25 30	?	36.5	—
Moncalieri		64.0	332	e 19 11	?S	(e 19 11)	-2	32.7	—
Barcelona		64.2	326	—	—	—	—	31.6	41.4
Tortosa		64.7	325	10 57	+14	—	—	29.5	—
San Fernando		66.2	318	33 30	?L	—	—	37.5	128.0
Rio Tinto		67.2	318	32 30	?L	—	—	(32.5)	142.5
Coimbra		69.8	320	—	—	—	—	e 35.6	45.7
Paris		69.8	332	—	—	—	—	e 36.5	37.5
De Bilt	E.	70.5	336	—	—	—	—	e 38.0	40.0
	N.	70.5	336	—	—	e 20 32	0	e 36.4	43.0
Shide		72.3	332	—	—	—	—	35.9	124.5
Stonyhurst		74.9	334	e 27 0	?SR ₁	e 40 6	?L	e 42.0	44.0
Eskdalemuir		76.3	335	—	—	—	—	37.5	—

Additional records: Cape Town gives S = +15m.54s. Simla gives M₂ = +87.1m. Rocca di Papa gives eP = 6h.7m.23s.—possibly a T₀.
Coimbra MN = +44.2m.

1918. Aug. 23d. 6h. 36m. 33s. Epicentre $11^{\circ}0'S$, $165^{\circ}0'E$.

A = -.948, B = +.254, C = -.191; D = +.259, E = +.966;
G = +.184, H = -.049, K = -.982.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia		22.8	100	i 5 9	-6	i 10 13	?SR ₁	11.4	12.4
Riverview		26.1	207	e 5 41	-8	i 10 15	-9	e 11.8	15.9
		26.1	207	i 5 45	-4	i 10 23	-1	—	16.8
Melbourne		32.3	210	(7 51)	?PR ₁	12 15	+2	19.2	20.4
Adelaide		33.9	221	6 41	-23	12 11	-28	17.7	20.7
Honolulu		48.7	48	8 57	-1	15 57	-5	23.8	30.2
Perth		49.8	237	9 20	+14	16 21	+5	24.4	27.9
Manila		50.6	300	e 9 8	-3	16 32	+6	26.0	27.7
Tokyo		52.4	335	9 22	0	—	—	—	—
Osaka		53.6	330	9 25	-5	16 55	-9	23.3	27.2
Kobe		53.7	330	i 9 29	-2	17 2	-3	24.0	28.0
Mizusawa	E.	54.8	337	9 38	0	17 11	-8	—	—
	N.	54.8	337	9 39	+1	17 10	-9	—	—
Taihoku		55.9	311	9 36	-9	17 24	-9	27.3	29.1
Batavia		57.6	270	9 57	+1	—	—	—	14.4
Zi-ka-wei		59.4	317	10 8	0	18 22	+6	e 28.2	34.8
Ootomari		61.0	344	10 34	+15	—	—	—	—
Berkeley		83.5	49	—	—	e 21 57	-66	—	—
Lick		83.7	50	—	—	e 22 27	-39	—	—
Victoria		86.5	39	22 58	?S	(22 58)	-38	39.2	50.6
Kodaikanal		89.6	280	22 51	?S	(22 51)	-79	—	—
Tucson		91.0	57	—	—	—	—	42.2	64.3
Mauritius	E.	101.8	246	17 27	?PR ₁	—	—	52.0	55.8
	N.	101.8	246	20 9	?PR ₁	—	—	52.6	56.0
Cipolletti		109.8	139	24 15	?	26 45	-41	—	64.8
Toronto		115.9	46	24 39?	?	(i 29 21)	+64	e 59.0	70.8
Pilar		116.7	134	22 15	?	—	—	—	—
Andalgala		117.1	129	22 15	?	27 45	-42	—	65.2
Ottawa		118.1	44	i 19 40	?PR ₁	e 29 50	+75	e 59.4	—
Ithaca	E.	118.3	48	—	—	29 52	+76	58.4	—
	N.	118.3	48	—	—	30 52	+136	61.0	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Georgetown	E.	118.5	51	i 20 15	?PR ₁	e 30 4	+86	e 57.0	—
	N.	118.5	51	e 20 15	?PR ₁	e 29 48	+70	e 56.8	—
Washington		118.5	51	e 19 54	?PR ₁	—	—	e 57.4	—
Cheltenham	E.	118.7	52	—	—	—	—	e 64.4	68.4
	N.	118.7	52	—	—	—	—	e 62.4	76.4
La Paz		120.7	117	e 19 17	?	30 59	?	51.6	60.5
Harvard		122.1	46	e 25 27	?	29 40	+35	60.3	—
Lemberg		129.6	328	e 21 21	?PR ₁	—	—	e 65.6	79.4
Vieques		130.8	75	—	—	—	—	67.4	73.4
Vienna	Z.	134.5	331	e 19 36	[+ 7]	—	—	—	—
De Bilt	E.	135.8	342	—	—	(e 40 9)	?SR ₁	e 64.4	65.0
	N.	135.8	342	—	—	—	—	e 67.4	67.7
Stonyhurst		136.0	349	—	—	i 41 3	?SR ₁	—	82.8
Athens		136.2	315	e 22 9	?PR ₁	—	—	—	—
Bidston		136.6	350	10 39	?	21 27	?PR ₁	—	80.6
Hohenheim		137.2	337	e 20 6	[+32]	—	—	—	—
Uccle		137.2	342	e 17 27	+28	(22 16)	?PR ₁	—	77.4
Triest		137.6	330	e 22 9	?PR ₁	—	—	—	—
Kew		137.8	346	72 27	?L	—	—	(72.4)	101.4
Pola		138.1	329	e 23 15	?PR ₁	—	—	e 63.2	88.4
Paris		139.5	342	e 22 33	?PR ₁	i 37 19	—	66.4	70.4
Milan		139.8	334	19 4	[-35]	—	—	76.4	86.6
Moncalieri		140.8	334	24 15?	?PR ₁	36 26?	?	55.3	87.8
Rocca di Papa		140.9	327	e 19 38	[- 3]	—	—	e 72.9	—
		140.9	327	e 20 56	?	(e 41 10?)	?SR ₁	e 41.2	41.4
Barcelona		146.0	337	19 53	[+ 3]	—	—	63.1	93.1
Algiers		149.5	331	20 2	[+ 7]	—	—	64.4	90.0
Coimbra		150.2	350	20 13	[+17]	—	—	e 62.4	89.9

Additional records: Riverview gives PS = +10m.34s. and +11m.23s., MZ = +15.4m., T₀ = 6h.36m.21s. Epicentre 10°-0S. 161°-5E. Melbourne SR₁ = +15m.33s. Adelaide PR₁ = +8m.11s., SR₁ = +13m.11s. Manila MN = +27.1m., T₀ = 6h.36m.24s. Osaka MN = +27.5m., T₀ = 6h.36m.34s. Batavia gives its records an hour late. Zi-ka-wei MN₁ = +31.2m., MN₂ = +34.2m. Victoria S = +28m.53s. Toronto S = +36m.21s., eL = +40.6m., eL = +61.2m. Ottawa e = 25m.48s., i = +36m.21s., L = +67.4m. Ithaca eE = +26m.57s., eN = +27m.26s., eE = +36m.32s. Georgetown L = +63.4m. Records given one hour late. Washington L = +63.4m. La Paz PR₁ = +21m.32s., +24m.12s., and +26m.5s., SR₁ = +32m.37s., +35m.59s., and +37m.58s. Harvard SE = +37m.41s., SN = +38m.26s., LE = +65.4m. and +72.4m., T₀ = 6h.48m.47s.? Vieques MN = +75.4m. De Bilt eE = +44m.42s. and +55m.36s., eN = +44m.55s. and +55m.19s. Epicentre 10°-0S. 161°-5E. Uccle gives S as PR₁. Kew gives its L, recorded as P, one hour too early. Pola MN = +74.7m. Paris iPN = +22m.38s., SR₁ = +40m.50s., M = +75.4m. Milan gives its M earlier than the L. This may be one hour wrong. Moncalieri MN = +87.9m. Coimbra eLN = +58.4m.

Aug. 23d. 22h. 34m. 30s. Epicentre 15°-0S. 151°-0E. (see 1918 Feb. 26).

A = -.845, B = +.468, C = -.259; D = +.485, E = +.875;
G = +.226, H = -.126, K = -.966.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	18.8	180	(e 4 26)	- 1	(e 7 54)	- 4	e 7.9	12.3
Adelaide	22.9	207	13 30	?L	—	—	(13.5)	16.7
Melbourne	23.4	192	—	—	11 36	?L	14.6	16.4
Perth	36.2	236	13 14	?S	(13 14)	+ 1	(18.3)	—
Manila	41.9	314	e 6 14	?	—	—	—	—
Honolulu	61.8	55	13 12	?PR ₁	—	—	15.3	15.7
Helwan	122.9	296	37 30	?SR ₁	—	—	—	—
De Bilt	134.1	331	e 20 48	?	—	—	e 65.5	74.8
Edinburgh	134.6	340	67 30	?L	—	—	(67.5)	—
Bidston	136.6	338	65 48	?L	73 6	?L	(65.8)	89.0
Tortosa	143.6	321	16 54	-31	—	—	73.5	78.9

Additional records: Riverview gives eP? = 22h.34m.6s., possibly intended to be a T₀, MN = +11.9m. Perth L = +24.4m. De Bilt MN = +67.8m. The Honolulu records do not fit (except the P, which is a very accurate PR₁), and may refer to another shock.

Aug. 23d. Records also at 0h. (Riverview), 7h. (Kodaikanal), 8h. (Edinburgh), 9h. (Riverview and Ann Arbor), 14h. (Tokyo and Mizusawa (2)), 16h. (Sydney), 17h. (Manila and Zi-ka-wei), 21h. (Apia), 22h. (San Fernando).

Aug. 24d. Records at 0h. and 2h. (Athens), 3h. (La Paz), 7h. (Athens), 11h. (Riverview), 13h. (Zagreb), 14h. (Athens), 16h. (De Bilt and La Paz), 17h. (Helwan and La Paz), 18h. (Riverview), 21h. (La Paz and San Fernando), 22h. (Paris).

Aug. 25d. 0h. 15m. 50s. Epicentre $37^{\circ}5'N$. $142^{\circ}5'E$. (as on 1916 Aug. 27d.).

$$A = -.630, B = +.483, C = +.609; \quad D = +.609, E = +.793; \\ G = -.483, H = +.370, K = -.793.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	2.0	327	0 34	+ 3	—	—	1.1	—
	N.	2.0	327	0 42	+11	—	—	1.3	—
Tokyo		2.9	231	e 0 53	+ 8	—	—	—	—
Manila		29.8	226	e 15 57	?L	—	—	18.0	18.4
Batavia		54.9	225	—	—	e 17 10	-10	—	22.2
Perth		13.8	203	—	—	—	—	32.1	—

Manila gives $MN = +18.3m$.

Aug. 25d. Records also at 1h. (De Bilt, Helwan, Eskdalemuir, and Bidston), 2h. (Manila), 5h. (Helwan), 6h. (San Fernando), 10h. (Riverview and Tokyo), 11h. (Melbourne), 12h. (Manila), 21h. (San Fernando), 22h. (La Paz and Paris).

Aug. 26d. 5h. 51m. 28s. Epicentre $30^{\circ}2'S$. $75^{\circ}0'E$.

$$A = +.224, B = +.835, C = -.503; \quad D = +.966, E = -.259; \\ G = -.130, H = -.486, K = -.864.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mauritius	N.	18.4	299	—	—	7 38	-11	—	11.0
	E.	18.4	299	—	—	8 32	+43	—	11.0
Colombo		37.3	8	13 32	?S	(13 22)	+ 4	—	—
Cape Town		47.4	250	21 32	?L	—	—	(21.5)	28.0
Manila		63.0	51	e 19 1	?S	(e 19 1)	0	—	—
Helwan		73.0	321	16 32	?	—	—	—	—
Rocca di Papa		92.0	319	e 12 32	-55	22 50?	-105	41.4	48.1
Algiers		95.0	310	—	—	—	—	35.5	40.5
Barcelona		98.2	314	—	—	—	—	e 37.2	43.3
Paris		102.0	320	—	—	—	—	e 40.5	48.5
De Bilt		102.3	324	—	—	—	—	e 39.9	42.3
Coimbra		104.5	308	—	—	—	—	e 39.7	—
Bidston		107.3	322	27 8	?S	(27 8)	+ 4	—	54.1
Eskdalemuir		108.2	324	—	—	—	—	41.5	—
Edinburgh		108.3	325	44 32	?L	—	—	(44.5)	—
La Paz		121.3	222	—	—	—	—	55.5	56.8

Additional records: Rocca di Papa $e = +33m.26s$. Bidston gives $S = +34m.44s$.

Aug. 26d. Records also at 5h. (Cape Town), 7h. (Tokyo), 8h. (Manila), 11h. (Osaka, Kobe, Tokyo, and Manila), 19h. (Manila), 21h. (Manila and San Fernando), 22h. (Monte Cassino), 23h. (La Paz).

Aug. 27d. Records at 1h. (Rocca di Papa and Manila), 5h. (San Fernando (2) and Lick), 7h. (Rio Tinto and Balboa Heights), 20h. (La Paz, Batavia, Tokyo, and Manila), 21h. (San Fernando).

Aug. 28d. Records at 6h. (Stonyhurst), 7h. (Apia), 12h. (Bidston), 15h. (Zi-ka-wei), 20h. (San Fernando).

Aug. 29d. 6h. 39m. 25s. Epicentre $41^{\circ}6'N. 35^{\circ}7'E.$

A = +.607, B = +.436, C = +.664; D = +.584, E = -.812;
G = +.539, H = +.387, K = -.748.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Athens	E.	9.9	252	2 30	+ 1	4 30	+ 4	15.0	6.0
	N.	9.9	252	2 32	+ 3	—	—	—	5.4
Lemberg		11.5	319	e 5 11	?S	(e 5 11)	+ 4	(e 6.3)	12.0
Helwan		12.3	198	5 23	?S	(5 23)	- 3	(6.6)	12.2
Budapest		13.2	302	e 4 41	?	—	—	—	—
Zagreb		14.8	293	e 1 46	?	—	—	—	11.6
Pompeii		15.9	274	e 3 49	- 2	e 8 39	?L	(e 8.6)	—
Pola		16.2	289	e 4 23	+28	—	—	e 8.4	10.6
Triest		16.3	292	e 4 3	+ 7	—	—	—	—
Monte Cassino		16.3	277	4 5	+ 9	—	—	—	11.6
Rocca di Papa		17.1	278	e 4 10	+ 4	e 7 13	- 7	e 10.2	10.9
Milan		19.5	290	e 3 38	?	5 5?	—	—	—
Zurich		20.1	296	e 4 53	+11	—	—	—	—
Moncalieri		20.5	289	4 54	+ 7	i 8 39	+ 5	11.5	15.5
De Bilt	E.	23.1	307	—	—	—	—	11.5	16.3
	N.	23.1	307	—	—	9 38	+11	10.9	14.9
Uccle		23.3	304	e 5 29	+ 9	e 9 35	+ 4	e 12.6	16.1
Paris		24.2	298	i 6 22	+52	e 9 52	+ 4	13.6	14.6
Barcelona		25.0	281	5 39	+ 1	10 3	0	13.6	17.0
Algiers		25.6	270	e 5 38	- 6	10 7	- 7	13.9	17.6
Tortosa		26.2	280	5 51	+ 1	10 21	- 5	—	19.7
Shide		26.8	302	6 46	+50	—	—	16.4	18.1
Edinburgh		28.8	313	10 35	?S	(10 35)	-38	—	24.1
San Fernando		32.6	275	17 35	?L	—	—	(17.6)	—
Coimbra		33.0	283	e 7 52	?PR ₁	12 44	+20	18.6	23.9

Additional records: Lemberg gives also a record at +7m.35s. Helwan
gives S as P and L as S. Pola MN = +10.1m. Moncalieri MN =
+14.9m., T₀ = 6h.39m.38s. Paris MN = +17.6m., T₀ = 6h.41m.26s.

Aug. 29d. Records also at 2h. (Taihoku), 3h. (Zi-ka-wei), 4h. (De Bilt), 5h. (Bidston, Eskdalemuir, and San Fernando), 9h. (Tokyo), 16h. (Monte Cassino), 17h. (Ootomari), 18h. (De Bilt), 21h. (Riverview and San Fernando), 22h. (Lick), 23h. (Sydney and Lick).

Aug. 30d. Records at 5h. (Perth), 14h. (Pompeii), 23h. (Lick).

Aug. 31d. 21h. 53m. 35s. Epicentre $9^{\circ}0'S. 111^{\circ}0'E.$

A = -.354, B = +.922, C = -.156; D = +.934, E = +.358;
G = +.056, H = -.146, K = -.988.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Batavia		5.0	304	i 1 23	+ 6	i 2 28	+11	—	4.0
Perth		23.4	169	5 44	?PR ₁	(9 33)	0	9.6	—
Manila		25.6	23	e 5 34	-10	—	—	—	—
Colombo		34.9	296	12 25	?S	(12 25)	-29	—	32.4
Kodaikanal		38.4	299	21 7	?L	—	—	(21.1)	—
Melbourne		42.0	139	14 31	?S	(14 31)	- 4	23.5	27.1
Riverview		44.4	130	e 8 32	+ 3	e 16 7	+60	e 23.8	30.5
Mauritius	E.	52.4	251	16 37	?S	(16 37)	-12	24.9	26.6
Helwan		85.7	301	23 25	?S	(23 25)	- 2	—	—
De Bilt		106.8	322	—	—	—	—	e 55.4	65.6
Edinburgh		110.8	327	58 25	?L	—	—	(58.4)	—
La Paz		154.5	182	e 20 2	[0]	e 33 40?	?	82.4	83.9

Additional records: Batavia gives T₀ = 21h.53m.38s. Colombo M = +16.4m.
Riverview e = +10m.17s., eSR₁? = +18m.19s., and +18m.45s., MN =
+26.8m., ME = +30.5m. Mauritius P = +18m.13s. De Bilt MN =
+63.6m.

Aug. 31d. Records also at 0h. (San Fernando), 1h. (Manila and Batavia), 5h. (Rocca di Papa), 18h. (Algiers), 21h. (San Fernando and Stonyhurst).

Sept. 1d. 6h. 27m. 55s. Epicentre $38^{\circ}3'N$. $20^{\circ}0'E$.

A = +.737, B = +.268, C = +.620; D = +.342, E = -.940;
G = +.582, H = +.212, K = -.785.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens		3.0	94	—	—	e 1 25	+ 2	i 1.9	2.2
Zagreb		8.0	340	e 2 5	+ 4	—	—	—	5.9
Helwan		12.6	129	3 5	—	—	—	—	—
Paris		16.4	316	—	—	—	—	14.1	—
De Bilt	E.	17.2	328	e 6 35	?S	(e 6 35)	-47	e 10.2	13.4
	N.	17.2	328	e 5 59	?S	(e 5 59)	-83	e 9.3	11.2
Shide		19.4	317	—	—	—	—	13.2	—

Sept. 1d. Records also at 11h. (Zagreb and Rocca di Papa), 14h. (Osaka), 16h. (De Bilt), 20h. (Manila, Monte Cassino, and Batavia), 21h. (San Fernando), 22h. (La Paz), 23h. (Helwan).

1918. Sept. 2d. 14h. 15m. 10s. Epicentre 0° . $145^{\circ}0'E$.

(as on 1917 June 1d.).

A = - 819, B = +.574, C = .000; D = +.574, E = +.819;
G = .000, H = .000, K = -1.000.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila		27.9	303	e 6 8	+ 1	10 50	- 7	13.8	14.9
Taihoku		33.8	320	e 5 22	-101	12 38	0	17.5	19.3
Riverview		34.3	171	e 5 54	-73	(e 13 20?)	+36	15.7	22.1
Sydney		34.3	171	11 8	?S	(11 8)	-96	—	—
Adelaide		35.5	189	—	—	13 4	+ 1	15.8	23.6
Osaka		35.8	347	7 54	+34	13 1	- 6	18.2	20.7
Melbourne		37.8	180	—	—	18 26	?L	(18.4)	21.9
Zi-ka-wei		38.3	327	e 7 33	- 7	e 13 46	+ 4	e 16.2	20.9
Batavia		38.6	260	7 31	-12	7 59	?	—	14.8
Perth		42.2	218	13 34	?S	(13 34)	-64	22.8	—
Honolulu		59.5	65	9 50	-19	17 20	-57	25.8	33.8
Colombo		65.4	277	31 50	?	—	—	—	—
Kodaikanal		67.9	281	39 26	?L	—	—	(39.4)	—
Victoria		91.2	42	42 12?	?L	—	—	(42.2)	52.5
Helwan		110.4	302	30 50	?	—	—	—	—
Zagreb		116.0	323	—	—	—	—	e 57.8	74.8
De Bilt	E.	118.0	333	—	—	—	—	e 59.8	60.8
	N.	118.0	333	—	—	—	—	e 61.8	64.7
Hohenheim		118.2	328	—	—	—	—	52.5	—
Edinburgh		118.5	340	29 50	?S	(29 50)	+72	—	77.3
Eskdalemuir		118.9	340	—	—	—	—	56.8	—
Uccle		119.3	333	—	—	e 38 50	?SR ₁	e 64.8	—
Stonyhurst		119.9	338	20 50	?PR ₁	—	—	—	76.4
Bidston		120.4	339	29 2	?S	(29 2)	+10	(41.6)	69.3
Kew		120.8	336	—	—	—	—	—	91.8
Toronto		121.1	36	—	—	—	—	64.5	—
Moncalieri		121.3	326	25 33	?	35 20	?SR ₁	58.8	75.3
Paris		121.5	332	—	—	e 43 50	?	62.8	72.3
Ottawa		122.1	33	—	—	—	—	64.8	—
Barcelona		126.7	326	—	—	—	—	e 70.1	—
San Fernando	E.	134.8	327	76 50	?L	—	—	84.8	—
	N.	134.8	327	33 50	?	—	—	85.8	—

Additional records: Manila gives MN = +17.1m. Riverview eS = +10m.44s., MN₁ = +17.5m., MZ = +20.2m. Osaka MN = +22.4m.
Melbourne SR₁ = +19m.44s., L = +21.2m. Zi-ka-wei MN = +21.9m.
Bidston gives S = +41.6m. (taken as L above). Toronto L = +70.9m.
Moncalieri MN = +76.8m. Paris MN = +74.8m. Ottawa eLN? = +52.8m.

Sept. 2d. Records also at 2h. (Manila), 10h. (Zi-ka-wei), 16h. (Stonyhurst and Rocca di Papa), 18h., 20h., and 21h. (La Paz), 22h. (San Fernando).

Sept. 3d. Records at 2h. (La Paz), 6h. (Mizusawa), 7h. (Tokyo), 13h. (Capetown) 14h. (Zagreb), 15h. (Batavia and Manila), 23h. (San Fernando).

Sept. 4d. 3h. 11m. 50s. Epicentre $9^{\circ}0'S.$, $111^{\circ}0'E.$ (as on 1918 Aug. 31d.).

$A = -.354$, $B = +.922$, $C = -.156$; $D = +.934$, $E = +.358$;
 $G = +.056$, $H = -.146$, $K = -.988$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia		5.0	304	1 16	- 1	2 16	- 1	—	3.2
Colombo		34.9	296	23 10	?L	—	—	(23.2)	—
Melbourne		42.0	139	—	—	—	—	e 25.2	31.2
Mauritius	E.	52.4	251	23 52	?L	—	—	(23.9)	26.0
Helwan		85.7	301	48 10	?L	—	—	(48.2)	—
De Bilt	N.	106.8	322	—	—	—	—	e 61.2	66.2
	E.	106.8	322	—	—	—	—	e 65.2	69.6
Eskdalemuir		111.0	326	—	—	—	—	64.2	—

Batavia gives $T_0 = 3h.11m.52s.$

Sept. 4d. 19h. 54m. 45s. Epicentre $36^{\circ}8'N.$, $114^{\circ}3'W.$ (as on 1918 May 6d. 4h.).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tucson	N.	5.3	147	1 28	+ 6	(e 2 24)	- 1	e 2.4	3.0
	E.	5.3	147	1 16	- 6	(e 2 4)	-21	e 2.1	3.0
Georgetown		29.2	74	—	—	—	—	e 15.4	—
Ottawa	N.	30.0	61	—	—	—	—	e 16.7	23.7

Sept. 4d. Records also at 1h. (Manila), 2h. (Barcelona and Tortosa), 3h. (Monte Cassino), 8h. (Tacubaya), 11h. (Tokyo), 13h. (Athens and La Paz), 17h. Batavia and Manila, 18h. (De Bilt), 20h. (Ann Arbor), 22h. (La Paz).

1918. Sept. 5d. 7h. 5m. 30s. Epicentre $5^{\circ}5'N.$, $124^{\circ}5'E.$

$A = -.564$, $B = +.826$, $C = +.096$; $D = +.824$, $E = +.566$;
 $G = -.054$, $H = +.079$, $K = -.995$.

This epicentre was independently computed, but is probably the same as that of Aug. 21d. 0h. and several previous dates in August, viz., $5^{\circ}4'N.$, $125^{\circ}2'E.$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Manila		9.7	339	e 2 27	+ 1	4 19	- 2	6.2	7.6
Taihoku		19.7	352	4 22	-15	7 45	-32	11.3	12.0
Batavia		21.2	236	e 4 58	+ 3	—	—	—	9.5
Zi-ka-wei	N.	25.8	354	5 44	- 2	10 14	- 4	—	—
	E.	25.8	354	5 36	-10	10 22	+ 4	—	—
Osaka		30.9	18	7 31	?PR ₁	—	—	—	18.1
Ootomari		44.2	18	7 28	-59	—	—	—	—
Colombo		44.5	271	14 30	?S	(14 30)	-39	—	—
Riverview		46.7	149	e 8 36	- 9	e 15 41	+ 4	e 28.6	36.4
Kodaikanal		46.8	279	25 30	?L	—	—	(25.5)	—
Melbourne		47.3	158	—	—	—	—	19.0	31.0
Mauritius		70.2	246	29 6	?L	—	—	(29.1)	—
Honolulu		76.4	69	e 39 48	?L	—	—	43.7	52.6
Rocca di Papa		102.2	315	e 19 8	?PR ₁	—	—	e 33.0?	58.7
De Bilt		102.9	327	e 24 42	?S	(24 42)	-101	e 60.5	—
Uccle		104.0	326	—	—	—	—	—	57.5
Moncalicri		104.4	319	e 18 44?	?PR ₁	28 27	+120	56.9	—
Edinburgh		105.2	333	22 30	?L	—	—	—	62.2
Eskdalemuir		105.5	332	24 58?	?L	—	—	48.5	—
Paris		106.0	325	—	—	—	—	e 60.5	—
Stonyhurst		106.0	331	—	—	—	—	—	63.8
Kew		106.1	328	—	—	—	—	—	70.5
Bidston		106.6	330	42 30	?L	52 18	?L	(52.3)	68.1
Shide		106.8	327	—	—	—	—	56.1	—
La Paz		163.4	133	e 20 10	[0]	33 52	?L	82.5	94.8

Additional records: Manila gives $MN = +6.8m.$ $Zi-ka-wei$ $S = +10m.8s.$
 Osaka $MN = +18.5m.$ Riverview $eP = +9m.12s.$, $eSR_1 = +19m.6s.$, $MN = +32.9m.$

Sept. 5d. Records also at 0h. (San Fernando), 1h. (Athens), 6h. (La Paz), 7h. (Rocca di Papa), 12h. (Victoria), 13h. and 14h. (La Paz), 16h. (River-view), 17h. (Melbourne), 19h. (Zi-ka-wei and Taihoku (3)).

Sept. 6d. 3h. 4m. 0s. (I) } Epicentre $35^{\circ}0'N$. $24^{\circ}0'E$. (as on 1913 Sept. 30
12h. 32m. 18s. (II) } and 1915 June 24d.).

$$A = +748, B = +333, C = +574; D = +407, E = -914; \\ G = +524, H = +233, K = -819.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
(II) Athens	2.9	358	1 35	?S	(1 35)	+15	1.9	2.1
(II) Helwan	8.1	129	8 42	?	—	—	—	—
(II) Rocca di Papa	11.1	311	e 2 49?	+ 3	—	—	—	5.7?
(II) Pola	12.5	325	e 3 20	+14	—	—	e 4.7	6.8
(II) Zagreb	12.5	332	3 0	- 6	i 5 21	-11	—	6.8
(II) Graz	13.7	335	e 3 22	0	—	—	—	—
(II) Moncalieri	15.9	314	—	—	e 6 57	+ 4	9.0	—
(II) Hohenheim	17.5	326	e 5 12	+61	—	—	—	—
(I) De Bilt	21.7	327	e 5 24	+23	8 54	- 5	e 17.0	20.4
(II)	21.7	327	—	—	—	—	e 15.3	—
(I) San Fernando	24.5	282	26 0	?	—	—	—	—
(I) Stonyhurst	26.3	324	—	—	—	—	—	27.8
(I) Bidston	26.4	322	10 18	?S	(10 18)	-12	(18.9)	25.8
(II)	26.4	322	8 30	?	—	—	—	16.4
(I) Eskdalemuir	27.6	326	4 25?	-99	10 0	-52	—	—
(I) Edinburgh	27.9	327	8 0	+113	—	—	—	—
(II)	27.9	327	8 42	+155	—	—	—	—
(I) Manila	87.2	74	e 12 57	- 3	—	—	—	—
(I) La Paz	101.1	258	64 10	?L	—	—	(64.2)	—

Additional records: Athens (II) gives MN = +2.2m. Pola (II) MN = +6.7m.
Zagreb (II) iNE = +5.8m., MNE = +6.2m. Moncalieri (II) S? = +8m.24s.
De Bilt (I) MN = +19.9m.

Sept. 6d. Records also at 0h. (Zagreb), 2h. (La Paz), 3h. (Rocca di Papa), 8h. (La Paz), 10h. (Monte Cassino), 12h. (Rocca di Papa and Athens (2)), 16h. (La Paz), 21h. (San Fernando), 22h. (La Paz).

Sept. 7d. 7h. 14m. 16s. Epicentre $11^{\circ}5'N$. $114^{\circ}0'E$. (as on 1917 Nov. 13d. 19h.).

$$A = -398, B = +895, C = +199.$$

Identification doubtful, as there is no direct S-P for evaluating T_0 .

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	7.5	65	—	—	e 3 28	+ 4	7.5	9.2
Taihoku	15.3	27	e 2 39	-64	—	—	9.1	—
Batavia	19.1	202	e 4 44	+14	—	—	—	9.7
Zi-ka-wei	20.9	18	—	—	7 12	-90	—	—
Colombo	34.0	266	15 44	?L	—	—	(15.7)	—
Riverview	57.5	143	—	—	e 17 44	- 9	e 26.3	29.5
Melbourne	57.2	151	—	—	18 14	+25	23.8	26.7
Helwan	78.1	298	25 44	?SR ₁	—	—	—	—
Honolulu	84.0	70	—	—	—	—	e 36.8	46.5
Rocca di Papa	90.6	313	—	—	(24 12)	- 8	24.2	28.1
De Bilt	92.1	324	—	—	25 11	+35	—	—
Paris	95.0	322	—	—	—	—	e 62.7	—
Eskdalemuir	95.3	329	—	—	25 44	+35	—	—
Kew	95.5	325	—	—	—	—	—	64.7
Bidston	96.1	326	49 2	?L	57 14	?	(49.0)	68.4
Balboa Heights	155.5	34	74 51	?	—	—	75.9	76.2
La Paz	174.6	158	e 18 55	?	28 53	?	—	—

Additional records: Manila gives MN = +8.3m. Riverview MN = +29.1m.,
Mz = +29.0m. Balboa Heights PN = +74m.59s., LN = +76.0m., MN =
+76.1m.

1918. Sept. 7d. 17h. 15m. 51s. Epicentre 46°5N. 151°4E.

A = -·604, B = +·330, C = +·725; D = +·479, E = +·878;
G = -·637, H = +·347, K = -·688.

The positive residuals of [P] for anticentric stations indicate a very shallow focus. The whole determination favours this as the graph of residuals against azimuth shows positive values for all values of the latter. A height of 0.030 above the normal depth has been assumed for the focus.

Station and Component.	Machine.	Corr. for Focus	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.	
		°	°	°	M. S.	S.	M. S.	S.	M.	M.	
Ootomari		O.	0.0	5.9	285	2 13	+42	2 54	+13	3.8	5.9
Mizusawa	E.	O.	+0.4	10.5	229	2 54	+11	(4 54)	+ 2	4.9	—
	N.	O.	+0.4	10.5	229	2 55	+12	—	—	5.2	—
Tokyo		W.	+0.6	13.9	228	3 46	+13	6 27	+ 7	7.6	9.2
Osaka		O.	+0.9	16.8	231	4 32	+19	—	—	8.0	9.1
Kobe		O.	+0.9	17.0	232	4 27	+11	(7 51)	+13	7.8	9.4
Nagasaki		O.	+1.3	21.4	236	5 4	- 9	—	—	8.8	—
Zi-ka-wei		—	+1.8	27.6	247	5 11	-11	11 14	-10	12.7	17.8
Taihoku		O.	+2.1	32.0	238	7 1	- 5	(12 42)	0	12.8	26.2
Hokoto		O.	+2.2	34.4	239	7 7	-20	12 45	-33	—	21.2
Manila		W.	+2.5	40.8	229	e 8 9	-11	14 45	- 7	20.2	32.2
Sitka		B.O.	+2.8	44.2	48	e 8 42	- 5	15 29	-12	22.4	32.4
Honolulu		M.	+3.0	47.9	104	9 9	- 3	16 9	-21	21.0	25.2
Victoria		M.	+3.4	54.6	54	7 47	?	10 11	? P	17.6	37.3
	Z.	—	+3.4	54.6	54	7 39	?	10 9	? P	—	26.2
Calcutta		O.E.	+3.4	55.5	267	10 15	+11	18 27	+17	28.0	41.0
Dehra Dun		O.	+3.5	57.5	282	11 9	+50	—	—	—	—
Berkeley	E.	—	+3.6	61.3	64	e 10 59	+15	e 20 10	+46	e 26.4	30.7
	N.	—	+3.6	61.3	64	e 11 6	+22	e 20 3	+39	e 26.4	29.5
	Z.	—	+3.6	61.3	64	e 10 49	+ 5	—	—	—	33.5
Saskatoon		Ma.	+3.6	61.6	41	10 40	- 6	i 19 22	- 5	26.7	—
Lick	E.	W.	+3.6	62.3	64	e 11 5	+15	e 19 45	+ 9	e 26.4	33.8
	N.	W.	+3.6	62.3	64	—	—	e 19 52	+16	e 26.3	33.7
Batavia		W.	+3.7	65.8	230	11 9	- 5	19 5	-75	e 27.2	42.2
Bombay		O.E.	+3.8	68.7	275	11 18	-15	21 24	+28	35.6	—
Apia		W.	+3.8	68.8	141	e 11 35	+ 1	20 56	- 1	31.2	37.2
Denver		W.	+3.8	70.2	53	21 9	? S	(21 9)	- 5	38.2	49.2
Kodaikanal		M.	+3.8	71.6	265	13 39	?	(21 51)	+21	21.8	51.4
Tueson	N.	B.O.	+3.8	72.0	62	12 19	+25	21 25	-10	e 36.2	50.2
	E.	B.O.	+3.8	72.0	62	12 21	+27	21 21	-14	e 35.2	56.1
Colombo		M.	+3.8	72.3	261	12 45	+49	(21 15)	-23	21.2	49.8
Lemberg		B.O.	+3.9	73.4	328	e 12 6	+ 3	e 21 27	-25	e 36.6	54.0
Dyce		Ma.	+3.9	74.0	346	i 12 12	+ 6	22 6	+ 7	44.8	53.0
Edinburgh		M.	+3.9	75.4	346	12 39	+24	—	—	—	51.6
Eskdalemuir		G.	+3.9	75.9	345	12 20	+ 2	—	—	—	—
Stonyhurst		M.	+3.9	77.2	344	e 8 45	?	i 14 15	?	i 24.2	—
De Bilt		—	+3.9	77.3	340	12 25	- 1	22 47?	+10	e 33.2	52.4
Bidston		M.S.	+4.0	77.7	345	12 21	- 8	23 27	+44	—	54.4
West Bromwich		—	+4.0	78.4	344	12 31	- 1	22 46	- 4	—	—
Ann Arbor	E.	B.	+4.0	78.6	38	12 33	- 1	—	—	—	47.2
	N.	B.	+4.0	78.6	38	12 9	-25	—	—	32.2	47.2
	E.	W.	+4.0	78.6	38	12 45	+11	—	—	32.2	47.2
	N.	W.	+4.0	78.6	38	13 3	-31	—	—	33.2	—
St. Louis		W.	+4.0	78.6	44	e 12 27	- 7	22 33	-20	38.0	41.4
Uccle		—	+4.0	78.9	340	12 33	- 2	22 52	- 4	34.2	55.5
Kew		M.	+4.0	79.0	342	14 9	?	—	—	—	54.2
Ottawa		—	+4.0	79.2	32	12 33	- 4	i 22 59	0	34.2	54.2
	Z.	—	+4.0	79.2	32	e 12 54	+17	—	—	e 36.6	—
Toronto		M.	+4.0	79.3	35	12 33?	- 5	i 22 57	- 3	i 37.2	57.8
Zagreb		W.	+4.0	79.7	330	e 12 39	- 1	i 23 5	- 1	46.2	—
Shide		M.S.	+4.0	79.9	343	12 47	+ 6	23 22	+14	34.5	—
		M.B.	+4.0	79.9	343	12 56	+15	23 7	- 1	35.6	55.6
Cork		M.	+4.0	80.1	347	12 29	-14	22 29	-40	—	51.6
Sydney		M.	+4.0	80.3	180	11 9	?	22 51	-20	42.6	51.0
Riverview		—	+4.0	80.3	180	e 12 39	- 5	(23 3)	- 8	e 33.2	34.9
Zurich		—	+4.0	80.7	336	e 12 44	- 2	i 23 18	+ 2	—	—
Paris		—	+4.0	80.9	340	i 12 45	- 2	i 23 16	- 2	35.2	39.1

Continued on next page.

Station and Component.	Machine.	Corr. for Focus	Δ	Azimuth.	P.	O—C.	S.	O—C.	L.	M.
					M. S.	S.	M. S.	S.	M.	M.
Pola	W.	+4.0	81.2	331	e 12 48	— 1	—	—	e 38.0	60.0
Northfield	B.O.	+4.0	81.4	30	12 45	— 5	e 22 11?	—72	44.2	59.2
Besançon	—	+4.0	81.5	337	12 41	—10	23 24	— 1	—	—
Ithaca	E. B.O.	+4.0	81.5	34	e 12 54	+ 3	22 49	—36	33.2	50.0
	N. B.O.	+4.0	81.5	34	e 12 59	+ 8	22 51	—34	—	59.6
Adelaide	M.	+4.0	82.2	191	13 22	+28	22 57	—35	34.4	53.0
Moncalieri	S.	+4.1	83.1	335	12 55	— 5	23 50	+ 7	34.5	47.3
Athens	N.	+4.1	83.5	321	12 57	— 6	23 39	— 9	32.2	56.2
	E.	+4.1	83.5	321	13 15	—12	—	—	33.8	56.3
Harvard	B.O.	+4.1	83.5	30	i 13 31	+28	23 36	—12	37.2	48.2
Halifax	—	+4.1	83.8	22	13 21	+17	i 23 57	+ 6	36.2	—
Washington	Mar.	+4.1	84.2	36	e 12 57	—10	e 23 31	—24	47.2	—
Georgetown	E.	+4.1	84.2	36	e 13 2	— 5	i 23 38	—17	e 34.0?	52.1
	N.	+4.1	84.2	36	e 13 2	— 5	e 23 35	—20	e 34.0?	57.2
Monte Cassino	Ag.	+4.1	84.3	329	13 2	— 5	—	—	—	85.0
Rocca di Papa	Ag.	+4.1	84.4	330	12 59	— 9	e 21 34	—144	e 29.6	59.1
Cheltenham	N. B.O.	+4.1	84.5	36	13 32	+24	24 9	+10	e 45.6	73.2
	E. B.O.	+4.1	84.5	36	13 32	+24	24 20	+21	e 45.6	68.7
Melbourne	M.	+4.1	84.5	185	13 39	+31	22 57	—62	38.8	—
Perth	M.	+4.1	84.7	210	13 14	+ 5	24 2	+ 1	40.7	79.2
Marseilles	Ma.	+4.1	85.3	336	i 13 9	— 3	i 24 4	— 3	50.2	55.2
Helwan	M.	+4.1	86.4	311	i 13 27	+ 8	—	—	—	58.2
Barcelona	—	+4.2	87.9	337	13 13	—15	24 24	—12	38.2	43.2
Tortosa	—	+4.2	88.9	338	13 26	— 7	24 34	—12	37.3	57.5
Coimbra	—	+4.2	91.5	345	13 45	— 2	25 6	— 7	48.3	68.0
Algiers	B.M.	+4.2	92.0	333	13 39	—11	24 36	—42	43.2	63.7
Rio Tinto	M.	+4.2	93.4	343	13 9	—49	—	—	—	60.6
Sau Fernando	M.	+4.2	94.7	342	14 9	+ 4	24 39	—66	33.2	64.2
Vieques	N. B.O.	+4.3	107.3	37	e 19 38	? PR ₁	—	—	51.8	69.4
	E. B.O.	+4.3	107.3	37	e 19 59	? PR ₁	27 23	—19	57.2	76.4
Balboa Heights	B.O.	+4.4	108.4	54	19 13	? PR ₁	—	—	47.2	57.6
Acera	M.	—	122.2	325	23 9	?	—	—	—	24.8
La Paz	Bi.	—	135.7	61	19 53	[+22]	31 22	—	57.7	66.8
La Quiaca	E. M.	—	141.5	64	27 21	?	74 15	? L	(74.2)	88.2
	N. M.	—	141.5	64	27 33	?	74 9	? L	(74.2)	—
Cape Town	M.	—	142.5	273	20 51	[+67]	—	—	23.6	24.7
St. Helena	M.	—	144.0	320	20 9	[+22]	—	—	—	—
Andalgala	E. M.	—	144.8	71	25 57	? PR ₁	74 45	? L	(74.8)	88.4
	N. M.	—	144.8	71	25 57	? PR ₁	75 9	? L	(75.2)	96.4
Pilar	M.	—	149.3	74	20 33	[+38]	85 21	? L	(85.4)	96.5
Cipolletti	M.	—	150.3	90	20 33	[+37]	69 51	? L	(69.8)	84.4
Rio de Janeiro	B.O.	—	153.6	31	e 20 45	[+44]	31 9	—	44.2	89.6
Chacareta	M.	—	154.6	73	22 27	? PR ₁	72 45	? L	(72.8)	91.6

Additional records : Ootomari records a second shock, probably from the same epicentre, at $T_0 = 20\text{h.}26\text{m.}5\text{s.}$, with $P = +2\text{m.}15\text{s.}$, $L = +3.7\text{m.}$, $MN = +4.4\text{m.}$. Osaka gives $MN = +8.6\text{m.}$. Zi-ka-wei $SRN = +12\text{m.}7\text{s.}$, $MN = +14.8\text{m.}$. Sitka $ePN = +8\text{m.}49\text{s.}$, $SN = +15\text{m.}28\text{s.}$, $MN = +30.8\text{m.}$. Victoria $i = +11\text{m.}53\text{s.}$. Berkeley $T_0 = 17\text{h.}15\text{m.}24\text{s.}$. Saskatoon gives $S = +17\text{m.}49\text{s.}$. The S in the table is recorded as i. Batavia $PR_1 = +13\text{m.}57\text{s.}$, $PR_2 = +15\text{m.}35\text{s.}$, $M = +22.2\text{m.}$. Bombay gives the "maximum by major arc" as 163.9m. , as shown by the tilt seismograph. Apia $PE = +11\text{m.}46\text{s.}$, $iS = +21\text{m.}5\text{s.}$, $iE = +28\text{m.}24\text{s.}$, $MN = +33.4\text{m.}$. Denver $PN = +22\text{m.}9\text{s.}$, $S = +32\text{m.}9\text{s.}$, $LN = +36.2\text{m.}$. Colombo $M = +59.0\text{m.}$. De Bilt $MN = +53.3\text{m.}$, $T_0 = 17\text{h.}$ (15m.52s.), Az. $N29^\circ E$. St. Louis $MN = +43.6\text{m.}$. Uccle $SR_1 = +28\text{m.}9\text{s.}$, $MN = +53.7\text{m.}$, $MZ = +54.1\text{m.}$. Kew $M = +58.2\text{m.}$. Ottawa $eS = +21\text{m.}20\text{s.}$, $T_0 = 17\text{h.}17\text{m.}37\text{s.}$. Toronto $e = +11\text{m.}21\text{s.}$, $eP = +13\text{m.}27\text{s.}$, $i = +16\text{m.}45\text{s.}$, $S = +21\text{m.}9\text{s.}$, $iL = +25.0\text{m.}$, etc. Zagreb $iP = +12\text{m.}37\text{s.}$, and $12\text{m.}45\text{s.}$. $iPR_1 = +16\text{m.}14\text{s.}$. Another $eP = 17\text{h.}34\text{m.}8\text{s.}$. Sydney $SR_1 = +29\text{m.}9\text{s.}$, $SR_2 = +33\text{m.}51\text{s.}$. Riverview $i = +13\text{m.}11\text{s.}$, $PR_1 = +15\text{m.}28\text{s.}$, $iS = +22\text{m.}39\text{s.}$, $MN = +38.6\text{m.}$. Pola $MN = +59.0\text{m.}$. Northfield $eL = +54.2\text{m.}$, $LE = +52.2\text{m.}$. Adelaide $PR_1 = +16\text{m.}47\text{s.}$, $SR_1 = +28\text{m.}52\text{s.}$. Moncalieri $MN = +53.8\text{m.}$. Athens $P = +13\text{m.}15\text{s.}$, $mN = +24.4\text{m.}$, $LN = +32.2\text{m.}$, $MN = +56.4\text{m.}$. Harvard $M = +24.6\text{m.}$, $T_0 = 17\text{h.}17\text{m.}14\text{s.}$. Halifax gives $S = +22\text{m.}41\text{s.}$. The S in above table

Notes continued on next page.

is recorded as i. Washington eL = +33.2m., ?SR₁. Rocca di Papa MN = +55.8m., eP = +33m.0s., M = +35.6m. Melbourne SR₁ = +28m.3s., SR₂ = +32m.15s. Perth PR₂ = +20m.25s., SR₁ = +29m.6s., SR₂ = +33m.6s. Barcelona SP = +26m.13s., LN = +30.4m., MN = +53.2m. Coimbra PR₁N = +17m.37s., PR₂N = +20m.18s., SR₁N? = +30m.57s., SR₁E? = +31m.8s., LN = +45.7m., MN = +65.1m. San Fernando MN = +64.2m. and +70.6m., ME = +66.2m. and +88.7m. Balboa Heights PN = +19m.25s., LN = +47.4m., MN = +59.0m. Record given as 8d. La Paz PR₁N = +23m.33s., SN = +31m.38s., SR₁N = +34m.51s., SR₁E = +36m.9s., and many other phases. La Quiaca PE = +49m.21s., PN = +48m.51s., MN = +94.6m. Cape Town M = +86.7m. Andalgala ME = +98.6m., PN = +48m.9s. Pilar PN = +56m.33s. Chacarita P = +39m.27s., M = +102.4m.

This shock was followed by a number of others, most of which were recorded only at Mizusawa and Ootomari, with others probably at Mizusawa alone. But that on Sept. 7d. 20h. 26m. 0s. is confirmed by Zi-ka-wai. P = +6m.8s., M = +26.9m., and Osaka P = +4m.35s., M = +9.3m. The two on September 8 and one on September 14d. 17h. are given separately.

For the others the times for T₀ in Column 1 below are simply those of Mizusawa P less 2m.54s., as it occurs in the record for the main shock at 7d.17h.15m.51s. They are thus affected by the errors of the Mizusawa P. In the second column they have been converted into decimals of a day, and in the third they have been compared with an integral number of multiples (M given in the 4th column) of 21.0014 min. = .0145843 days from the date of the main shock, as this periodicity has been elsewhere suggested (Geop. Sup. to M.N. R.A.S., I p. 91).

The days in October (Oct. 10 and 14) are numbered 40 and 44, as though they formed part of September, though after so long an interval they may not belong to the series.

T ₀ in Sept. d. h. m. s.	T ₀ in days.	Resid.	(M.)	Mizusawa.		Ootomari.		
				P. m. s.	S. m. s.	P. m. s.	L. m.	M. m.
7 17 15 51	7.7194	.00	0	2 54	4 54	2 13	3.8	5.9
7 20 26 0	7.8514	+ 7	9	2 54	4 58	2 20	3.8	4.5
8 0 9 30	8.0066	-.45	20	2 44	4 24	(2 56)	(4.5)	(5.7)
8 5 40 30	8.2365	+66	35	2 31	4 12	1 50	3.9	5.0
8 8 30 42	8.3546	-.65	44	2 54	4 38	2 27	—	—
8 10 38 9	8.4431	-.55	50	2 54	4 33	2 19	—	—
8 11 35 54	8.4833	+55	52	2 54	4 31	2 11	—	—
8 20 18 37	8.8458	+34	77	2 54	4 32	2 6	—	—
9 11 17 36	9.4701	- 6	120	2 54	4 29	2 43	—	—
9 14 20 14	9.5972	-.36	129	2 54	—	2 6	—	—
11 2 27 6	11.1021	- 9	232	2 54	—	2 51	5.0	—
11 5 57 40	11.2484	- 9	242	2 54	4 32	2 11	4.1	4.4
12 13 15 18	12.5521	+53	331	2 54	4 30	2 11	—	—
13 5 59 22	13.2496	+27	379	2 54	4 26	2 22	3.6	—
14 17 4 45	14.7113	—	—	separately computed.				
22 12 58 13	22.5403	+32	1016	2 54	4 42	2 18	—	—
22 13 48 36	22.5754	-.54	1019	2 54	4 34	2 15	3.9	4.5
40 17 54 29	40.7458	+75	2264	2 54	4 9	2 23	—	—
44 1 29 55	44.0625	-10	2492	2 54	4 45	1 56	—	—

The residuals of Column 3 do not show any appreciable clustering about zero, or indeed about any other value. These aftershocks are apparently *not* controlled by the 21min. period. But Dr. Jeans has made a suggestion of a different kind in his paper on the *Propagation of Earthquake Waves* (Proc. R.S.A., Vol. 102, 1923, p. 554). He finds in addition to the L waves several other series of surface waves; two important sets of which complete the circuit of the globe in $t_1 = 125.8$ min. = .087361 days, and $t_2 = 222.0$ min. = .15417 days, and he suggests that the returns of these to the epicentre after a number of multiples, $mt_1 + nt_2$, may cause the repeated shocks. Combinations of early multiples are made in the following table:

$t_1 \backslash t_2$	0	1	2	3	4	5
0	.0000	.1542	.3083	.4625	.6167	.7708
1	.0874	.2416	.3957	.5499	.7041	.8582
2	.1747	.3289	.4830	.6372	.7914	.9455
3	.2621	.4163	.5704	.7246	.8788	1.0329
4	.3494	.5036	.6577	.8119	.9661	1.1202
5	.4368	.5910	.7451	.8993	1.0535	1.2076
6	.5242	.6784	.8325	.9867	1.1409	1.2950
7	.6115	.7657	.9198	1.0740	1.2282	1.3823
8	.6989	.8531	1.0072	1.1614	1.3156	1.4697
9	.7862	.9404	1.0945	1.2487	1.4029	1.5570
10	.8736	1.0278	1.1819	1.3381	1.4903	1.6444

The table has been extended perhaps further than necessary in order to make sure that nothing has been overlooked. Now, on subtracting the date of the main shock (which we take to be that of Sept. 7d. 17h., since nothing from the neighbourhood of this epicentre is recorded previously for some days at any rate) from those which follow, we get differences

$$\cdot 1320, \cdot 2872, \cdot 5271, \cdot 6352, \cdot 7237, \cdot 7639, 1\cdot 1264.$$

Of these we have

$$\left. \begin{aligned} \cdot 5271 &= 6t_1 + \cdot 0029 \\ \cdot 6352 &= 2t_1 + 3t_2 - \cdot 0020 \\ \cdot 7237 &= 3t_1 + 3t_2 - \cdot 0009 \\ \cdot 7639 &= 7t_1 + t_2 - \cdot 0018 \\ 1\cdot 1264 &= 4t_1 + 5t_2 + \cdot 0062 \end{aligned} \right\} \quad (a)$$

But there is nothing in the table to fit the first two differences $\cdot 1320$ and $\cdot 2872$. It is however noteworthy that the *differences* of these from one another and from the next shock do occur in the table, viz.:

$$\begin{aligned} \cdot 2872 - \cdot 1320 &= \cdot 1552 = t_2 + \cdot 0010. \\ \cdot 5271 - \cdot 2872 &= \cdot 2399 = t_1 + t_2 - \cdot 0016. \end{aligned}$$

Therefore, if we count from the second shock as starting-point, the differences are all expressible as multiples of t_1 and t_2 : and this continues to hold beyond the third shock, since

$$\left. \begin{aligned} \cdot 6352 - \cdot 1320 &= \cdot 5032 = 4t_1 + t_2 - \cdot 0004 \\ \cdot 7237 - \cdot 1320 &= \cdot 5917 = 5t_1 + t_2 + \cdot 0007 \\ \cdot 7639 - \cdot 1320 &= \cdot 6319 = 2t_1 + 3t_2 - \cdot 0053 \end{aligned} \right\} \quad (b)$$

But we have already seen in (a) that

$$\cdot 6352 = 2t_1 + 3t_2 - \cdot 0020, \text{ etc.}$$

Substituting this in (b) we see that

$$\begin{aligned} \cdot 1320 &= -2t_1 + 2t_2 - \cdot 0016, \\ \text{and hence} \quad \cdot 2872 &= -2t_1 + 3t_2 - \cdot 0006 \\ \cdot 5271 &= -t_1 + 4t_2 - \cdot 0022 \end{aligned}$$

In other words, if we shifted the origin of time back to a moment $2t_1$ before the first recorded shock, we could express the times of all the following shocks in the form $mt_1 + nt_2$. The new origin would be at

$$\text{Sept. } 7\cdot 7194 - \cdot 1747 = \text{Sept. } 7\cdot 5447 = \text{Sept. } 7\text{d. } 13\text{h. } 4\text{m. } 15\text{s.}$$

About this time La Paz records a shock $eP = 13\text{h. } 2\text{m. } 11\text{s.}$, $S? = 13\text{h. } 6\text{m. } 38\text{s.}$, $i = 13\text{h. } 8\text{m. } 37\text{s.}$, $i = 13\text{h. } 9\text{m. } 12\text{s.}$, $L = 13\text{h. } 10\text{m. } 0\text{s.}$, $M = 13\text{h. } 11\text{m. } 0\text{s.}$ La Paz is 136° from the epicentre under discussion. It is conceivable that something happened near the anticentre (44° from La Paz) which ultimately set up the above series of shocks at the epicentre. If so the true S at La Paz must be one or other of the records marked i. They would give

$$\begin{array}{lll} S - P = 6\text{m. } 26\text{s.} & \Delta = 42^\circ \cdot 3 & T_0 = 12\text{h. } 53\text{m. } 58\text{s.} \\ \text{or } S - P = 7\text{m. } 1\text{s.} & \Delta = 48^\circ \cdot 2 & T_0 = 12\text{h. } 53\text{m. } 16\text{s.} \end{array}$$

But this is not early enough for the effect to reach the present epicentre by $13\text{h. } 4\text{m. } 15\text{s.}$ The available interval is only 10min. or 11min., whereas the shortest time of transmission through the earth is 21min. We conclude that nothing is actually on record which would justify us in dating from $13\text{h. } 4\text{m.}$ rather than from the time of the first recorded shock ($17\text{h. } 15\text{m.}$); and for the present we must leave unexplained the fact that the first three terms of the series can only be expressed in the form $mt_1 + nt_2$ if we admit values -1 and -2 for m .

Returning now to the later shocks we may arrive quickly at suggestions for their representation by use of the relations

$$2t_1 - t_2 = + \cdot 0205, \quad 4t_2 - 7t_1 = + \cdot 0051$$

and by studying the differences between consecutive recorded shocks.

Date.	Diff.
8·8458	
9·4701	$\cdot 6243 = 2t_1 + 3t_2 - \cdot 0129 = 4t_2 + \cdot 0076.$
9·5972	$\cdot 1271 = t_2 - \cdot 0271 = 2t_2 - 2t_1 - \cdot 0066.$
11·1021	$1\cdot 5049 = 10t_1 + 4t_2 + \cdot 0146 = 19t_1 - t_2 - \cdot 0008.$
11·2484	$\cdot 1463 = t_2 - \cdot 0079.$
12·5521	$1\cdot 3047 = 6t_1 + 5t_2 + \cdot 0097 = 22t_1 - 4t_2 - \cdot 0006.$
13·2496	$\cdot 6975 = 8t_1 - \cdot 0014.$
14·7113	$1\cdot 4617 = 8t_1 + 5t_2 - \cdot 0080 = 15t_1 + t_2 - \cdot 0029.$

We thus have (adopting the earlier origin),

$$\begin{aligned}
 8.8458 &= 7.5447 + 6t_1 + 5t_2 + .0062 \\
 9.4701 &= \text{,,} + 15t_1 + 4t_2 - .0016 \\
 9.5972 &= \text{,,} + 20t_1 + 2t_2 - .0029 \\
 11.1021 &= \text{,,} + 39t_1 + t_2 - .0037 \\
 11.2484 &= \text{,,} + 23t_1 + 11t_2 - .0013 \\
 12.5521 &= \text{,,} + 45t_1 + 7t_2 - .0029 \\
 13.2496 &= \text{,,} + 60t_1 + 3t_2 + .0008 \\
 14.7113 &= \text{,,} + 75t_1 + 4t_2 - .0021
 \end{aligned}$$

But the later multiples could be expressed in alternative forms without large residuals. Thus

$$23t_1 + 11t_2 - .0018 = 30t_1 + 7t_2 + .0033,$$

since we can add $7t_1 - 4t_2 + .0051 = 0$ to any of the expressions, and it seems doubtful whether we can identify the correct multiples with our present knowledge. The evidence is, however, distinctly favourable to Dr. Jeans's suggestion.

We may append the times of possible repetitions, recorded at Mizusawa only.

Date.				In days.	
d.	h.	m.	s.		
Sept. 7	20	48	54	7.8673	$= 7.5447 + 2t_1 + t_2 - .0063$
„	7	22	19	7.9305	$= \text{,,} + t_1 + 2t_2 - .0099$
„	8	10	17	8.4291	$= \text{,,} + 3t_1 + 4t_2 + .0056$
„	9	10	6	9.4214	$= \text{,,} + 2t_1 + 11t_2 + .0061$
„	9	11	47	9.4914	$= \text{,,} + 17t_1 + 3t_2 - .0009$

We can refer them to the date of the first recorded shock by subtracting $2t_1$, and it is noteworthy that one of the above would then have a coefficient -1 for t_1 , though its large residual makes it doubtful whether it belongs to the series. There is, however, another way of representing this term, if we may use the interval $(t_1 + t_2)/2 = m$, as suggested in the note to Aug. 11, viz.:

$$\begin{aligned}
 7.9305 &= 7.5447 + 3t_1 + m + .0029 \\
 &= 7.7194 + t_1 + m + .0029
 \end{aligned}$$

—so that if we use m we need not go behind the first shock. The question arises whether the use of m would obviate this necessity in other cases; but the answer seems to be in the negative, for we have to explain the first difference .1320, which differs from m ($= .1208$) by $+ .0108$, too large a quantity for an admissible residual. For the present we must be content to leave the difficulties stated. It is perhaps worth remarking that the perplexing difference $.1320 = 3t_1/2$, but it does not seem that this can help us.

Sept. 7d. 20h. 26m. 0s. See note above. Recorded at Mizusawa, Ootomari, Osaka, and Zi-ka-wei.

Sept. 7d. 23h. 31m. 51s. Epicentre $12^\circ 0'N$. $95^\circ 0'E$. (as on 1918 Jan. 18).

$$\begin{aligned}
 A &= -.085, B = +.974, C = +.208; D = +.996, E = +.087; \\
 G &= -.018, H = +.207, K = -.978.
 \end{aligned}$$

(The absence of records from Indian and even Japanese stations suggests that this epicentre may be wrongly identified from the scanty material).

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Taihoku	28.2	62	—	—	e 11 28	+25	—	—
Tokyo	46.7	50	e 5 4	-221	—	—	—	—
Vienna	73.5	316	e 12 9	+30	—	—	—	—
Zagreb	73.9	314	e 12 27	+46	—	—	44.1	—
Graz	74.1	314	e 12 9	+26	—	—	—	—
Rocca di Papa	76.3	310	e 12 53	+56	—	—	—	14.2
De Bilt	80.5	320	e 12 17	-5	e 22 8	-21	e 43.1	45.5
Uccle	81.1	320	e 12 15	-11	—	—	—	49.1
Paris	82.6	318	—	—	e 22 51	-2	46.1	54.6
Kew	83.8	321	—	—	—	—	—	53.1
Eskdalemuir	84.7	323	—	—	—	—	36.1	—
Bidston	85.1	322	40 51	?L	44 39	?L	(40.8)	90.4

Additional records: De Bilt eLN = +42.1m., MN = +52.8m. Paris MN = +89.1m.

Sept. 7d. Records also at 12h. (Lawrence), 13h. and 14h. (La Paz), 17h. (Rocca di Papa), 18h. (Osaka and Rocca di Papa), 19h. (Osaka, Tokyo, Rocca di Papa (2), and Zagreb), 20h. (Rocca di Papa, Zi-ka-wei, Tokyo (3), Mizusawa, Osaka (2), and Zagreb), 21h. (Zagreb, Rocca di Papa, and Mizusawa (3)), 22h. (Mizusawa), 23h. (Mizusawa (2)).

1918. Sept. 8d. 0h. 9m. 30s. Repetition from the epicentre of
7d. 17h., 46°5N. 151°4E.

A = -·604, B = +·330, C = +·725 ; D = +·479, E = +·878 ;
G = -·637, H = +·347, K = -·688.

Station and Component.	Machine.	Corr. for Focus	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	°	M. S.	S.	M. S.	S.	M.	M.
Ootomari	O.	0·0	5·9	285	2 56	+85	—	—	4·5	5·7
Mizusawa	O.	+0·4	10·5	229	2 43	0	4 24	-28	—	—
Tokyo	O.	+0·6	13·9	228	3 44	+11	6 23	+3	—	—
Osaka	O.	+0·9	16·8	231	4 34	+21	—	—	8·1	9·2
Kobe	O.	+0·9	17·0	232	3 44	-32	(7 20)	-18	7·3	12·3
Zi-ka-wei	—	+1·8	27·6	247	e 6 32	+10	e 11 3	-21	—	17·6
Manila	W.	+2·5	40·8	229	—	—	—	—	e 25·5	—
Honolulu	M.	+3·0	47·9	104	16 18	?S	22 54	?	26·6	31·5
Victoria	M.	+3·4	54·6	54	—	—	—	—	—	40·6
Kodaikanal	M.	+3·8	71·6	265	25 36	?SR ₁	—	—	—	—
Colombo	M.	+3·8	72·3	261	45 30	?L	—	—	(45·5)	49·5
De Bilt	—	+3·9	77·3	340	12 (30)	+4	22 (30)	-7	e 36·5	47·0
Graz	W.	+4·0	78·8	331	e 12 44	+9	22 54	-1	—	—
Uccle	—	+4·0	78·9	340	e 12 36	+1	e 22 54	-2	e 45·5	51·5
Kew	M.	+4·0	79·0	342	—	—	—	—	—	57·5
Hohenheim	—	+4·0	79·2	336	i 12 42	+5	22 58?	-1	—	—
Toronto	M.	+4·0	79·3	35	—	—	—	—	e 40·3	55·0
Zagreb	W.	+4·0	79·7	330	e 12 48	+8	22 30	-36	43·5	—
Moncalieri	S.	+4·1	83·1	335	—	—	10 45	?	20·6	54·6
Harvard	B.O.	+4·1	83·5	30	—	—	36 36	?	e 47·0	52·3
Rocca di Papa	Ag.	+4·1	84·4	330	e 12 43	-25	e 23 8	-50	e 49·4	58·0
Barcelona	—	+4·2	87·9	337	—	—	—	—	e 44·6	60·5
Coimbra	—	+4·2	91·5	345	e 18 30	?PR ₁	—	—	e 49·0	—
Algiers	B.M.	+4·2	92·0	333	—	—	—	—	46·5	60·5
San Fernando	N. E.	—	+4·2	94·7	57 30	?L	—	—	(57·5)	62·5
La Paz	Bi.	—	94·7	342	56 30	?L	—	—	(56·5)	65·5
			135·7	61	20 10	[+39]	—	—	67·5	68·9

Additional records: Mizusawa PN = +2m.45s. Kobe MN = +10·8m.
Zi-ka-wei MN = +15·0m. Victoria gives P or L? = +2m.26s. De Bilt
eLN = +37·5m., MN = +50·0m. Toronto iL = +52·4m., L = +67·1m.
Moncalieri records eP? at 0h.8m.24s. Rocca di Papa records eP as
0h.12m.13s. and eS as 0h.22m.38s. It has been assumed above that these
are mistakes for 22m. and 32m. respectively. La Paz PR₁ = +23m.11s.

1918. Sept. 8d. 5h. 40m. 30s. Epicentre $46^{\circ}5'N$. $151^{\circ}4'E$.
(as at 7d. 17h. and 8d. 0h.).

But this repetition appears to have a focus of roughly the normal depth. See further note at end.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Ootomari	O.	5.9	285	1 50	+19	—	—	3.9	5.0
Mizusawa	O.	10.5	229	2 31	- 6	(4 2)	-41	4.0	—
Tokyo	O.	13.9	228	4 18	+53	7 26	+80	—	—
Osaka	O.	16.8	231	2 16	-106	(6 6)	-67	6.1	8.7
Kobe	O.	17.0	232	4 9	+ 4	—	—	10.3	11.2
Zi-ka-wei	—	27.6	247	e 6 2	- 2	e 10 44	- 8	—	19.5
Manila	W.	40.8	229	e 9 52	? PR ₁	—	—	—	—
Honolulu	M.	47.9	104	e 8 30	-23	15 12	-41	24.2	27.0
Victoria	M.	54.6	54	22 30	? SR ₁	—	—	34.0	41.0
Kodaikanal	M.	71.6	265	50 30	? L	—	—	(50.5)	—
Edinburgh	M.	75.4	346	22 0	? S	(22 0)	+30	—	61.5
Eskdalemuir	G.	75.9	345	21 56	? S	(21 56)	+20	40.5	—
De Bilt	—	77.3	342	12 (16)	+13	22 12	+20	e 41.5	46.6
Vienna	—	77.3	331	i 12 14	+11	—	—	—	—
Bidston	M.S.	77.7	345	21 18	? S	(21 18)	-39	—	50.2
Uccle	—	78.9	340	e 12 12	0	e 22 12	+ 1	e 44.5	47.5
Kew	M.	79.0	342	—	—	—	—	—	53.5
Hohenheim	—	79.2	336	i 12 26	+12	23 32?	+78	—	—
Ottawa	—	79.2	32	—	—	e 31 0	?	—	—
Toronto	M.	79.3	35	—	—	—	—	33.2	47.6
Zagreb	W.	79.7	330	e 12 30	+13	22 30	+10	43.5	—
Riverview	—	80.3	180	—	—	—	—	e 45.2	51.6
Paris	—	80.9	340	—	—	e 22 50	+16	45.5	49.0
Moncalieri	S.	83.1	335	e 12 39	+ 2	23 6	+ 8	32.6	—
Harvard	B.O.	83.5	30	—	—	—	—	46.1	—
Rocca di Ppapa	Ag.	84.4	330	e 12 24	-20	—	—	—	55.9
Melbourne	M.	84.5	185	e 22 30	? S	(22 30)	-44	—	56.5
Helwan	M.	86.4	311	23 30	? S	(e 23 30)	- 4	—	56.5
Barcelona	—	87.9	337	—	—	—	—	42.2	52.3
Coimbra	—	91.5	345	—	—	e 26 10?	+101	e 49.0	—
Rio Tinto	M.	93.4	343	50 30	? L	—	—	(50.5)	57.5
La Paz	Bi.	135.7	61	e 22 39	? PR ₁	35 45?	—	68.6	80.7

Additional records: Ootomari MN = +6.3m. Mizusawa LE = +4.0m.
Osaka MN = +11.6m. Kobe MN = +11.3m. Zi-ka-wei MN = +19.3m.
De Bilt eLN = +43.5m., MN = 51.8m., T₀ = 5h.40m.(48s.). Bidston S = +28.8m. = SR₁? Graz (Δ = 78°.8), T₀ = 5h.40m.30s. Uccle T₀ = 5h.40m.36s. Ottawa eN = +27m.30s. Toronto eL = 45.0m. and 47.4m.
Riverview MN = +47.6m. Moncalieri T₀ = 5h.40m.40s. Harvard LE = +51.5m.

As above remarked, the epicentre of Sept. 7d. 17h. seems to suit this earthquake, but without the supposition of a high focus. The difference between the two cases can be clearly indicated by a direct comparison of the records at such stations as are well represented in both lists. The excess of the residuals (P and S) for September 7d. 17h. over those for Sept. 8d. 5h. are as below, in the 4th and 5th columns.

	Δ	Az.	P. s.	S. s.	$\delta \Delta$ Equiv. P. S.	Theory. P. S.	
Ootomari	5.9	285	+23	—	+1.5	—	+0.0
Mizusawa	10.5	229	+23	+42	+1.5	+1.6	+0.4
Kobe	17.0	232	+18	—	+1.5	—	+0.9
Zi-ka-wei	27.6	247	+ 9	+30	+0.9	+1.7	+1.8
Honolulu	47.9	104	+39	+57	+5.8	+4.8	+3.0
De Bilt	77.3	342	+ 9	+35	+1.5	+3.1	+3.9
Uccle	78.9	340	+21	+40	+3.6	+3.5	+4.0
Zagreb	79.7	330	+ 9	(-25)	+1.5	(+3.0)	+4.0
Paris	80.9	340	—	26	—	+2.3	+4.0
Moncalieri	83.1	335	+16	+44	+2.8	+4.1	+4.1
Rocca di Papa	84.4	330	+35	—	+6.1	—	+4.1
Melbourne	84.5	185	—	+27	—	+2.4	—
La Paz	135.7	61	-166	-263	—	—	—
Mean	—	—	—	—	+2.7	+2.9	+2.6

It is clear from inspection of the 5th and 6th columns that the residuals in S are in general larger than those in P, in about the usual ratio 1.8 to 1.0. The S difference -25s. for Zagreb may be taken as +35s., with an error of one minute. The case of La Paz will be referred to presently.

In the 7th and 8th columns the differences in time for P and S are converted into differences of Δ by use of the tables for the appropriate Δ , and it will be seen that, though there are considerable accidental errors, still (a) the S residuals are sensibly equal to the P residuals; (b) both P and S tend to increase with Δ , though not so markedly as they should according to the theoretical values reproduced in the last column from the Sept. 7 results. As regards La Paz it seems clear that quite different phenomena were recorded on the two occasions on Sept. 7d., probably [P] and [S], on Sept. 8d.5h. perhaps PR₁ and SR₁.

Sept. 8d. 8h. 30m. 42s. }
 10h. 38m. 9s. } Repetitions from the epicentre of Sept. 7d.17h.15m.,
 11h. 35m. 54s. } 46°·5N. 151°·4E. See note to that earthquake.
 20h. 18m. 37s. }

Sept. 8d. Records also at 0h. (Balboa Heights and Mizusawa (2)), 1h. (Zagreb and Mizusawa (2)), 2h. (Manila, De Bilt, and Mizusawa), 3h. (Barcelona and Mizusawa (3)), 4h. (Osaka and Mizusawa), 6h. (Mizusawa (3)), 7h. (Mizusawa and Tokyo), 9h. (Mizusawa), 10h. (Mizusawa (2)), 11h. (Helwan, De Bilt, Mizusawa, and Zi-ka-wei), 12h. (De Bilt, Zagreb, Edinburgh, Rio Tinto, Honolulu, and Mizusawa), 13h. (Manila, Osaka, Mizusawa, and San Fernando), 14h. (La Paz), 17h. (Mizusawa), 18h. (Helwan), 21h. (De Bilt and Helwan), 22h. (Batavia, Victoria, Manila, Zi-ka-wei, and Helwan), 23h. (Eskdalemuir, De Bilt, and Mizusawa).

Sept. 9d. 11h. 17m. 36s. } Further repetitions from 46°·5N. 151°·4E., the
 14h. 20m. 14s. } epicentre of Sept. 7d. 17h. See note to that
 } earthquake.

Sept. 9d. Records at 0h. (Victoria), 4h. and 6h. (Mizusawa), 8h. (La Paz), 12h. (Victoria, La Paz, San Fernando, Manila, Helwan, and Riverview), 14h. (Riverview, Manila, and Batavia), 15h. (Helwan), 21h. (Manila and Mizusawa).

Sept. 10d. Records at 0h. (San Fernando), 3h. (Athens and Mizusawa), 10h. (Lick and Berkeley), 13h. (Mizusawa), 14h. (Helwan), 15h. (Mizusawa and Manila), 16h. (La Paz and Monte Cassino), 18h. (Mizusawa), 21h. (Manila), 23h. (Monte Cassino (2)).

Sept. 11d. 2h. 27m. 6s. Repetition from 46°·5N. 151°·4E. See note to Sept. 7d. 17h.

Sept. 11d. 3h. 47m. 9s. Epicentre 36°·8N. 114°·3W. (as on 1918 Sept. 4d.).

A = -·330, B = -·730, C = +·599; D = -·911, E = +·412;
G = -·246, H = -·546, K = -·801.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tucson	5·3	147	e 1 22	0	(e 2 11)	-14	e 2·2	3·5
Berkeley	6·4	280	—	—	—	—	e 3·9	—
Ann Arbor	24·1	67	—	—	—	—	16·4	—
Georgetown	29·2	74	—	—	—	—	e 17·0	—
Washington	29·2	74	—	—	—	—	e 16·5	—
Cheltenham	29·4	75	16 55	?L	—	—	(16·9)	20·8
Harvard	N. 33·4	68	e 17 19?	?L	—	—	(17·3?)	—
	E. 33·4	68	e 18 50?	?L	—	—	19·9	—
Stonyhurst	72·1	35	—	—	—	—	—	48·8

Additional records : Tucson gives MN = +2·8m. Ann Arbor LE = +16·8m.,
LN = +15·2m. and +16·6m. Cheltenham PN = +16m.49s. Harvard
eE = +18m.50s.? LN? = +19·8m., LE = +19·9m. Ottawa gives 4h.5m.
to 4h.17m.

1918. Sept. 11d. 4h. 6m. 5s. Epicentre 6°·5N. 126°·0E.

A = -·584, B = +·804, C = +·113; D = +·809, E = +·588;
G = -·066, H = +·092, K = -·994.

On 1918 Feb. 7d. 5h. 20m. an epicentre 6°·5N. 127°·0E. was adopted with focal depth +·025 below normal. Direct comparison of the observations support this hypothesis of difference in focal depth.

Station and Component.	Machine.	\angle	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Manila	W.	9·5	330	e 2 34	+11	—	—	5·6	6·4
Taihoku	O.	19·0	347	e 4 3	-26	8 7	+ 5	11·4	11·9
Batavia	W.	22·9	237	i 5 14	- 2	i 9 20	- 3	—	9·9
Zi-ka-wei	—	25·0	351	5 39	+ 1	e 9 57	- 6	—	16·0
Mizusawa	O.	35·4	21	6 17	-60	—	—	—	—
Perth	M.	39·6	194	10 23	?	13 54	- 6	18·0	—
Adelaide	M.	42·9	166	14 40	?S	(14 40)	- 7	(21·3)	—
Colombo	M.	45·9	273	14 25	?S	(14 25)	-62	—	—
Riverview	—	46·8	151	e 8 46	0	e 15 41	+ 3	e 24·8	29·7
Sydney	M.	46·9	151	19 13	?SR ₁	24 55	?L	(24·9)	—
Melbourne	M.	47·7	160	—	—	15 55	+ 5	20·1	30·9
Kodaikanal	M.	48·2	278	18 49	?	—	—	—	—
Bombay	O. E.	53·2	289	9 24	- 3	—	—	—	—
Mauritius	M.	71·9	246	20 49	?S	(20 49)	0	—	—
Honolulu	M.	74·7	69	e 11 43	- 4	21 43	+21	39·9	48·9
Helwan	M.	90·8	300	14 55	+95	—	—	—	—
Zagreb	W.	99·0	318	e 14 1	- 4	(e 17 54)	?PR ₁	52·9	64·9
Rocca di Papa	Ag.	102·6	315	e 18 10	?PR ₁	—	—	—	18·7
De Bilt	E. N.	102·9	327	(e 18 37)	PR ₁	—	—	e 53·3	57·7
Uccle	—	102·9	327	—	—	—	—	e 53·7	54·5
Moncalieri	S.	104·0	326	—	—	—	—	e 52·9	56·9
Edinburgh	M.	104·6	320	e 17 56?	?PR ₁	26 21	-17	42·0	60·0
Eskdalemuir	M.	105·0	333	23 55	?	—	—	—	71·4
Stonyhurst	G.	105·4	333	e 18 50	?PR ₁	e 29 28	?	47·4	60·5
Kew	M.	105·9	331	—	—	—	—	—	45·1
Bidston	M.S.	106·1	328	—	—	—	—	—	74·9
Shide	—	106·4	331	29 25	?	38 55	?	—	60·5
Barcelona	—	107·1	328	—	—	—	—	55·5	71·7
Coimbra	—	109·9	319	—	—	—	—	e 59·1	63·3
San Fernando	E. N.	117·4	322	e 61 40?	?L	—	—	66·4	—
Ottawa	—	118·0	318	66 55	?L	—	—	(66·9)	70·9
La Paz	Bi.	118·0	318	58 55	?L	—	—	(58·9)	71·9
	—	124·7	18	—	—	—	—	e 57·9	—
	—	162·9	127	20 23	[+13]	—	—	—	—

Additional records: Manila gives MN = +6·9m. Zi-ka-wei PMN = +5m.47s., PME = +6m.6s., SME = +10m.14s., SMN = +10m.17s., MN = +17·2m. Adelaide gives P at 3h.20m.45s., S at 3h.27m.20s. It is assumed that P is S and S is L, and both are 1h. wrong. Riverview PR₁ = +10m.43s., PS = +16m.0s., eSR₁ = +19m.9s. and +19m.23s., SR₂ = +20m.21s., M₂ = +31m.49s. Zagreb MNW = +59·9m. Moncalieri MN = +57·7m. Stonyhurst M = +29·9m. Ottawa LE = +70·9m., etc.

Sept. 11d. 5h. 56m. 57s. Repetition from 46°·5N. 151°·4E. See note to Sept. 7d. 17h.

Sept. 11d. Records also at 0h. (Mizusawa), 1h. (Mizusawa (2)), 2h. (Mizusawa), 3h. (Moncalieri, Helwan, Edinburgh, and Adelaide), 5h. (Stonyhurst), 6h. (Ootomari, De Bilt, Manila, and Moncalieri), 10h. (Riverview, Apia, and Uccle), 11h. (Edinburgh and Helwan), 12h. (Helwan), 16h. (Rocca di Papa), 20h. (Rocca di Papa, Helwan, Athens (2), and De Bilt), 21h. (Helwan, Rocca di Papa, De Bilt, and Athens (3)), 22h. (Athens).

Sept. 12d. 9h. 38m. 30s. Epicentre $39^{\circ}5'N$. $72^{\circ}0'E$.
 $A = +.234$, $B = +.734$, $C = +.636$; $D = -.951$, $E = -.309$;
 $G = +.197$, $H = +.605$, $K = -.772$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Simla		9.4	152	e 2 24	+ 2	—	—	—	—
Dehra Dun		10.3	150	2 30	— 4	—	—	—	—
Bombay		20.6	178	4 43	— 5	—	—	—	—
Calcutta	E.	21.9	136	5 0	— 4	9 0	— 3	—	—
	N.	21.9	136	5 6	+ 2	9 6	+ 3	—	—
Colombo		33.3	166	12 30	?S	(12 30)	+ 1	—	—
Helwan		34.5	267	9 30	?	—	—	—	—
Vienna		40.1	301	e 9 0	?PR ₁	—	—	—	—
Graz		40.9	300	9 3	?PR ₁	14 48	+28	—	—
Zagreb		40.9	298	e 8 31	+29	—	—	—	—
Rocca di Papa		44.2	293	e 7 27	-60	(15 24?)	+19	15.4?	—
De Bilt		46.5	309	—	—	i 16 13	+38	i 20.5	—
Moncalieri		46.6	299	15 41	?S	(15 41)	+ 5	20.0	—
Manila		49.4	106	e 16 30	?S	(e 16 30)	+19	—	—
Edinburgh		50.4	315	21 30	?L	—	—	(21.5)	37.2
Eskdalemuir		50.6	315	—	—	i 17 11	+45	—	—
Shide		50.9	308	—	—	—	—	22.0	—
Bidston		51.0	312	8 24	-49	17 18	+47	—	31.1

Rocca di Papa gives maxima between P and S, ME = +9.2m., MN = +11.5m.
 Moncalieri is? = +18m.26s. = SR₁?

1918. Sept. 12d. 13h. 15m. 20s. Epicentre $46^{\circ}5'N$. $151^{\circ}4'E$.
 (as on Sept. 7d. 17h.).

 $A = -.604$, $B = +.330$, $C = +.725$; $D = +.479$, $E = +.878$;
 $G = -.637$, $H = +.347$, $K = -.688$.

When a direct comparison is made between the records for this earthquake and those for Sept. 7d. 17h. the agreement is fairly consistent. Hence, though the material is scanty a focal height of 0.030 above the normal has been assumed as for Sept. 7d. 17h.

Station and Component.	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ootomari		0.0	5.9	285	2 9	+38	—	3.3	4.6
Mizusawa	E.	+0.4	10.5	229	2 52	+ 9	—	4.5	—
	N.	+0.4	10.5	229	2 58	+15	—	4.5	—
Zi-ka-wei		+1.8	27.6	247	—	—	—	e 10.4	17.6
Taihoku		+2.1	32.0	238	e 12 45	?S	(12 45)	+ 3	18.7
Honolulu		+3.0	47.9	104	16 10	?S	(16 10)	-20	26.8
Victoria		+3.4	54.6	54	—	—	—	—	36.2
Colombo		+3.8	72.3	261	42 40	?L	—	(42.7)	—
Edinburgh		+3.9	75.4	346	21 40	?S	(21 40)	-35	47.7
Eskdalemuir		+3.9	75.9	345	—	—	—	—	40.7
Vienna		-3.9	77.3	331	—	—	—	e 42.7	—
De Bilt		+3.9	77.3	340	—	—	e 22 (40)	+ 3	e 48.7
Bidston		+4.0	77.7	345	23 28	?S	(23 28)	+45	—
Graz		+4.0	78.8	331	e 12 28	- 7	—	—	51.2
Uccle		+4.0	78.9	340	—	—	—	e 44.7	53.7
Kew		+4.0	79.0	342	—	—	—	—	59.7
Zagreb		+4.0	79.7	330	e 12 39	- 1	22 52	-14	44.7
Riverview		+4.0	80.3	180	—	—	—	e 40.1	50.8
Paris		+4.0	80.9	340	—	—	—	e 46.7	51.2
Moncalieri		+4.1	83.1	335	—	—	e 29 5	?	43.9
Rocca di Papa		+4.1	84.4	330	—	—	e 32 58	?	47.9
Melbourne		+4.1	84.5	195	—	—	—	—	42.9
Helwan		+4.1	86.9	311	24 40	?S	(24 40)	+21	—
Barcelona		+4.2	87.9	337	—	—	—	e 49.0	54.0
Coimbra		+4.2	91.5	345	55 0	?L	—	56.7	—

Additional records: Ootomari MN = +3.6m. Taihoku S = +16m.13s.
 Bidston S = +28m.58s. = SR₁?. Zagreb eNW = +12m.45s. Paris MN
 = +48.2m.

Sept. 12d. 18h. 3m. 0s. Epicentre 55°·0N. 160°·0W. (as on 1917 June 22d.).

A = -·539, B = -·196, C = +·819; D = -·342, E = +·940;

G = -·770, H = -·280, K = -·574.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Sitka	N.	13·8	71	e 3 24	+ 1	(5 6)	-57	5·1	6·9
	E.	13·8	71	e 3 30	+ 7	(c 5 4)	-59	e 5·1	6·8
Victoria		23·4	90	5 15	- 6	—	—	7·7	9·2
Honolulu		33·7	177	e 12 42	?S	(12 42)	+ 6	14·4	15·4
St. Louis		48·2	79	—	—	—	—	e 22·5	—
Ottawa	N.	51·4	63	e 22 0	?SR ₁	—	—	e 24·3	—
Washington		55·3	70	—	—	e 21 0	?SR ₁	26·2	—
Edinburgh		67·5	14	26 0	?SR ₁	—	—	—	—

Additional records: St. Louis L = +82·0m. and +99·1m.

Sept. 12d. 18h. 25m. 45s. Epicentre 43°·4N. 72°·0W. (as on 1918 Aug. 21d. 4h.).

A = +·225, B = -·691, C = +·687; D = -·951, E = -·309;

G = +·212, H = -·653, K = -·727.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Ithaca		3·5	255	e 0 51	- 4	—	—	e 2·8	—
Toronto		5·4	275	—	—	(e 2 33)	+ 5	e 2·6	3·0
Cheltenham	N.	5·9	220	—	—	—	—	e 4·0	4·7
	E.	5·9	220	—	—	—	—	e 4·4	5·2
San Fernando		49·6	74	—	—	—	—	24·2	28·2
De Bilt		50·1	51	—	—	(e 19 45)	?SR ₁	e 19·8	32·1
Mizusawa		92·2	335	—	—	—	—	57·6	—

Additional records: Ithaca gives eLN = +1·9m. Toronto eL = +0·6m. and eL? = +43·3m. San Fernando PN = 12h.13m.0s. (some error?), MN = +27·2m. De Bilt MN = +20·1m. Mizusawa E/W = +59·1m.

Sept. 12d. Records also at 1h. (San Fernando), 2h. (Athens and Mizusawa), 6h. (Athens), 7h. (Athens and Zagreb), 11h. (Athens), 13h. (Zagreb), 14h. (Ootomari and Mizusawa (2)), 15h. (Athens), 16h. (Zi-ka-wei), 17h. (Athens (2)), 20h. (Helwan), 22h. (De Bilt).

Sept. 13d. 6h. 54m. 12s. I } Epicentre 21°·0N. 120°·0E.
 7h. 7m. 40s. II } (as on 1917 Feb. 17 and Aug. 14).
 7h. 50m. 18s. III }
 11h. 3m. 15s. IV }

A = -·467, B = +·808, C = +·358; D = +·866, E = +·500;

G = -·179, H = +·310, K = -·934.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
I Taihoku	O.	4·3	19	1 14	+ 7	(1 55)	- 3	1·9	—
II	O.	4·3	19	0 57	-10	(1 41)	-17	1·7	—
III	O.	4·3	19	1 12	+ 5	(2 3)	+ 5	2·0	—
IV	O.	4·3	19	1 10	+ 3	(1 59)	+ 1	2·0	—
I Manila	W.	6·4	171	e 1 32	- 6	—	—	3·6	—
II	W.	6·4	171	e 1 50	+12	—	—	—	—
III	W.	6·4	171	e 1 34	- 4	—	—	3·8	5·2
IV	W.	6·4	171	e 1 35	- 3	—	—	3·6	—
I Zi-ka-wei	—	10·3	7	—	—	—	—	e 5·2	—
II	—	10·3	7	—	—	—	—	—	7·6
III	—	10·3	7	—	—	—	—	e 5·6	8·0
IV	—	10·3	7	e 2 47	+13	—	—	—	6·8
I Mizusawa	O.	25·6	40	5 28	-16	—	—	—	—
II	O.	25·6	40	5 24	-20	—	—	—	—
I Batavia	W.	30·1	207	e 6 48	+19	—	—	—	—
III	W.	30·1	207	5 42	-47	—	—	—	—

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
I Colombo	M.	41.4	256	9 20	? PR ₁	—	—	25.7	—
III	M.	41.4	256	25 42	? L.	—	—	(24.8)	—
IV	M.	41.4	256	24 45	? L.	—	—	33.0	—
IV Riverview	—	62.3	151	—	—	—	—	(44.4)	—
II Mauritius	M.	73.3	240	44 26	? L.	—	—	(30.3)	—
II Helwan	M.	78.7	298	30 20	? L.	—	—	(33.8)	—
IV	M.	78.7	298	33 45	? L.	—	—	—	—
I De Bilt	—	87.7	326	—	—	e 22 (37)	-72	e 48.3	50.1
II	—	87.7	326	—	—	—	—	e 48.3	49.8
III	—	87.7	326	—	—	—	—	e 48.3	50.0
IV	—	87.7	326	—	—	—	—	e 47.4	50.1
IV Rocca di Papa	Ag.	88.2	315	—	—	—	—	e 56.8	65.6
IV Uccle	—	88.7	325	—	—	—	—	e 48.8	51.8
I Edinburgh	M.	89.5	332	22 48	? S	(22 48)	-81	—	66.3
IV	M.	89.5	332	38 45	? L.	—	—	(38.8)	52.8
I Eskdalemuir	G.	89.8	332	—	—	—	—	45.8	—
IV	G.	89.8	332	—	—	—	—	43.8	—
II Stonyhurst	M.	90.4	330	—	—	—	—	—	54.6
III	M.	90.4	330	—	—	—	—	—	54.6
II Kew	M.	90.7	328	56 20	? L.	—	—	(56.3)	—
I Paris	—	90.8	324	—	—	—	—	e 49.8	57.8
IV Bidston	M.S.	90.9	330	40 24	? L.	—	—	(40.4)	47.8
IV	M.S.	90.9	330	24 57	? S	(24 57)	+34	—	55.0
II Shide	—	91.7	327	—	—	—	—	41.9	—
III	—	91.7	327	—	—	—	—	54.8	—
IV	—	91.7	327	—	—	—	—	47.4	—
II Coimbra	—	102.2	322	—	—	—	—	e 58.1	—

Additional records: Manila III MN = +4.8m. Zi-ka-wei II MN = +9.1m., III MN = +8.8m., IV MN = +6.6m. De Bilt I MN = +50.2m., II MN = +49.9m., III MN = +49.9m. Uccle gives 7h.56m. to 8h.11m. and 8h.39m. to 8h.51m. Paris gives eL from 7h.44m. to 8h.0m.

Sept. 13d. 9h. 7m. 35s. Epicentre 40° 3N. 139° 5E.

A = -.580, B = -.495, C = +.647; D = +.649, E = +.760;
G = -.492, H = +.420, K = -.763.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Mizusawa	1.7	133	0 28	+ 2	0 47	- 1	—	—
Tokyo	4.7	178	0 44	-29	1 13	-56	1.4	1.6
Osaka	6.5	212	1 59	+20	—	—	3.4	4.6
Kobe	6.6	213	1 40	- 1	—	—	3.0	3.4
Ootomari	6.8	19	2 24	+40	—	—	4.0	—
Zi-ka-wei	17.2	244	e 4 7	0	—	—	—	—
De Bilt	E. 79.6	333	—	—	—	—	e 43.4	48.5
	N. 79.6	333	(e 12 14)	- 3	e 12 14	?P	e 44.4	45.2

Additional records: Mizusawa gives SN = +49s. Tokyo MN = +1.5m., M₂E = +3.0m., M₂N = +2.3m., &c. Osaka MN = +4.0m. Kobe MN = +2.6m. Zi-ka-wei PME = +4m.13s.

Sept. 13d. Records also at 0h. (San Fernando and Mizusawa), 1h. (De Bilt), 2h. (Kodaikanal), 3h. (Athens), 4h. (Mizusawa (2)), 6h. (De Bilt), 9h. (Mizusawa), 10h. (Athens), 13h. (Athens and Mizusawa), 15h. (Mizusawa and Tokyo), 16h. (Taihoku (2)), 18h. (Mizusawa), 23h. (San Fernando).

1918. Sept. 14d. 17h. 4m. 45s. Epicentre 45°·0N. 152°·1E.

A = -·625, B = +·331, C = +·707 ; D = +·468, E = +·884 ;
G = -·625, H = +·331, K = -·707.

Direct comparison indicates that this is not a mere repetition of either Sept. 7d. 17h. or Sept. 8d. 5h.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
Ootomari	O.	6·7	294	1 58	+16	—	—	3·5	4·3
Mizusawa	O.	10·0	238	2 32	+ 2	4 11	-18	—	—
Tokyo	W.	13·2	236	e 3 42	+26	(e 5 42)	- 7	e 5·7	—
Osaka	O.	16·4	237	3 5	-52	(6 53)	-11	6·9	13·4
Kobe	O.	16·5	237	e 4 0	+ 1	—	—	9·9	12·3
Zi-ka-wei	—	27·6	251	5 54	-10	10 30	-22	—	15·9
Taihoku	O.	31·7	241	—	—	e 11 30	-33	18·3	19·4
Manila	W.	40·2	231	e 8 3	+ 6	13 57	-13	15·2	15·7
Honolulu	M.	47·0	103	e 8 51	+ 4	15 39	- 2	26·2	29·8
Victoria	M.	55·1	54	16 32	? S	(16 32)	-50	32·3	40·1
Batavia	W.	65·2	231	—	—	—	—	—	21·2
Apia	W.	67·3	142	i 20 28	? S	(20 28)	+34	—	21·2
Bombay	O.E.	69·3	276	20 4	? S	(20 4)	-14	—	42·6
Colombo	M.	72·7	262	21 15	? S	(21 15)	+17	—	48·8
Lemberg	B.O.	75·0	328	e 13 51	? —	—	—	e 42·6	46·6
Edinburgh	M.	77·0	346	18 15	? —	—	—	—	48·8
De Bilt	N. E.	78·8	340	12 26	+14	22 12	+ 2	36·3	52·5
		78·8	340	—	—	22 16	+ 6	—	44·6
Stonyhurst	M.	78·8	345	—	—	—	—	—	51·2
Riverview	—	78·9	181	e 12 33?	+21	e 22 13?	+ 2	e 33·0	41·2
Sydney	M.	78·9	181	21 51	? S	(21 51)	-20	—	—
Bidston	M.S.	79·3	345	15 45	? PR ₁	22 21	+ 6	—	53·8
Ann Arbor	B.	79·5	39	10 45	-91	21 33	-45	40·2	—
Ottawa	—	80·2	32	12 23	+ 3	22 27	+ 2	e 36·8	—
Toronto	M.	80·2	35	e 16 39	? PR ₁	e 21 21	-64	37·3	51·2
Uccle	—	80·2	340	e 12 21	+ 1	e 22 21	- 4	44·3	45·3
Kew	M.	80·7	343	—	—	—	—	—	50·2
Zagreb	W.	81·2	331	e 12 25	- 1	i 22 33	- 4	(e 43·3)	54·3
Shide	—	81·6	344	22 44	? S	(22 44)	+ 2	42·6	65·4
Ithaca	B.O.	82·5	34	e 17 15	? PR ₁	22 32	-20	e 41·1	—
Paris	—	82·5	340	i 12 35	+ 2	i 22 47	- 5	43·2	47·1
Pola	W.	82·8	332	e 23 16	? S	(e 23 16)	+21	e 45·0	47·5
Melbourne	M.	83·0	186	—	—	(23 15)	+18	23·2	23·4
Harvard	B.O.	84·5	31	—	—	e 34 39	? —	e 46·8	—
Moncalieri	S.	84·7	336	12 40	- 6	24 1	+45	42·2	49·9
Athens	N. E.	85·0	322	12 43	- 5	23 2	-17	—	53·9
		85·0	322	e 12 48	0	—	—	e 37·8	55·4
Washington	Mar.	85·1	36	12 51	+ 2	23 11	- 9	46·2	—
Georgetown	—	85·1	36	e 12 55	+ 6	23 24	+ 4	47·2	—
Rocca di Papa	Ag.	86·0	331	i 12 50	- 3	23 10	-20	e 46·6	56·8
Helwan	M.	87·8	312	14 33	+89	—	—	—	62·8
Barcelona	—	89·5	338	—	—	i 23 58	-11	34·2	48·8
Tortosa	—	90·5	339	23 42	? S	23 42	-37	46·2	59·2
Coimbra	—	93·1	345	e 20 5	? —	30 55	? SR ₁	46·1	55·3
Algiers	B.M.	93·6	334	—	—	e 23 57	-55	51·2	53·7
Rio Tinto	M.	95·0	343	26 15	? S	(26 15)	+69	—	59·2
San Fernando	—	96·3	343	—	—	—	—	52·2	55·2
Mauritius	M.	106·9	258	55 15	? L	—	—	(55·2)	59·4
La Paz	Bi.	135·9	63	19 36	[+ 4]	—	—	65·8	67·6

For Notes see next page.

NOTES TO SEPT. 14d. 17h. 4m. 45s.

Additional records: Ootomari gives MN = +6.4m. Mizusawa PN = +2m.35s. Osaka MN = +10.9m. Kobe MN = +12.4m. Zi-ka-wei MN = +15.9m. Manila MN = +15.3m. Honolulu T_0 = 17h.5m.2s. Victoria S = +20m.58s., probably L. Batavia gives e = 17h.5m. Edinburgh records P as 11h. De Bilt T_0 = 17h.(5m.23s.). Epicentre 44° 7' N. 153° 5' E. Riverview MN = +40.7m. Ottawa L = +39.2m., +50.2m., &c., T_0 = 17h.5m.1s. Toronto eL = +43.2m., L = +50.2m. Uccle T_0 = 17h.5m.6s. Zagreb iP = +12m.37s. and +12m.45s., eS = +22m.28s., T_0 = 17h.5m.5s. Also eP = 17h.44m.42s. Pola eS = +33.4m., MN = -55.2m. Harvard L = +50.0m., +54.1m., +60.1m., and +65.0m. Moncalieri MN = +54.8m. Athens T_0 = 17h.5m.7s. Georgetown LE = +50.7m. Coimbra PR₁N? = +21m.15s., LN = +49.0m., MN = +61.2m. San Fernando MN = +58.8m. Mauritius PN = +59m.27s. (=ME), MN = +63.4m. La Paz PR₁ = +23m.44s. Andalgala and Cipolletti record P at 18h.23m.36s. and 18h.16m.48s. respectively, which may refer to this earthquake, with an error of 1h. But the fit even then is not good, and these observations have been relegated to the final note.

Sept. 14d. Records also at 1h. (Taihoku), 4h. and 9h. (Mizusawa), 18h. (Cipolletti, Andalgala, and Cape Town), 19h. (Mizusawa), 21h. (Athens), 23h. (Edinburgh).

Sept. 15d. 16h. 41m. 6s. Epicentre 34° 5' N. 10° 0' W. (as on 1915 July 11d.).

A = +.812, B = -.143, C = +.566; D = -.174, E = -.985;
G = +.558, H = -.098, K = -.824.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
San Fernando	3.7	56	1 6	+ 8	—	—	—	—
Coimbra	5.9	12	1 24	—	2 22	-19	—	2.6
De Bilt	20.7	27	—	—	—	—	e 10.5	11.2
Zagreb	22.7	52	e 7 13	?	—	—	—	9.2

Coimbra gives MN = 1s. less than ME, T_0 = 16h.41m.17s. De Bilt MN = +10.8m. San Fernando and De Bilt both suggest epicentre 36° 0' N. 11° 0' W., which would perhaps give a better result than the old epicentre adopted above.

Sept. 15d. Records also at 0h. (San Fernando), 2h. (Zi-ka-wei), 3h. (Taihoku), 4h. (Edinburgh), 6h. (Manila and Victoria), 7h. (Osaka and Zi-ka-wei), 9h. (Edinburgh and Athens), 10h. (Zagreb), 12h. (Zi-ka-wei (2) and Taihoku), 13h. (La Paz), 18h. (Honolulu, De Bilt, Zi-ka-wei, and Manila), 20h. (Zi-ka-wei).

Sept. 16d. 5h. 55m. 45s. Epicentre 21° 0' N. 120° 0' E. (as on 1918 Sept. 13d.).

A = -.467, B = +.808, C = +.358; D = +.866, E = +.500;
G = -.179, H = +.310, K = -.934.

	Δ °	Az. °	P. m. s.	O - C. s.	L. m.	M. m.
Taihoku	4.3	19	1 20	+13	2.1	—
Manila	6.4	171	e 1 31	- 7	3.1	4.9
Colombo	41.4	256	25 15	?L	(25.2)	—
Kodaikanal	42.3	263	27 9	?L	(27.2)	—
De Bilt	87.7	326	—	—	e 48.2	57.3
Edinburgh	89.5	332	51 15	?L	(51.2)	55.8
Bidston	90.9	330	53 27	?L	(53.4)	60.6

Additional records: Manila gives MN = +3.5m. De Bilt gives MN = +57.2m.

Sept. 16d. 13h. 4m. 0s. Epicentre $48^{\circ}5S$, $162^{\circ}5E$.

$A = -.632$, $B = +.199$, $C = -.749$; $D = +.301$, $E = +.959$;
 $G = +.714$, $H = -.225$, $K = -.663$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Melbourne	16.6	304	(3 54)	- 6	3 54	?P	7.3	9.8
Riverview	17.0	326	i 4 5	0	e 7 20	+ 2	e 8.6	9.1
Sydney	17.0	326	3 54?	-11	—	—	—	—
Adelaide	22.3	299	—	—	(9 35)	+24	9.6	12.7
Honolulu	78.2	37	e 22 0	?S	(e 22 0)	- 2	41.7	45.6
La Paz	101.0	131	56 23	?L	—	—	(56.4)	79.2
Victoria	116.1	45	57 49?	?L	—	—	(57.8?)	68.6
Toronto	138.0	74	—	—	—	—	67.2	74.5
Helwan	138.7	260	76 0	?L	—	—	(76.0)	—
Ottawa	141.1	74	—	—	—	—	e 69.0	—
Athens	148.6	269	e 76 49	?L	—	—	(e 76.8)	77.0
Rocca di Papa	157.8	264	e 50 39	?	—	—	e 54.2	—
	157.8	264	—	—	—	—	e 96.0	99.5
Moncalieri	162.5	268	—	—	—	—	e 101.2	—
De Bilt	165.2	293	—	—	—	—	e 87.0	102.9
San Fernando	165.4	219	32 0	?	—	—	(93.0)	—
Paris	166.8	279	—	—	—	—	e 98.0	106.5
Eskdalemuir	168.9	313	—	—	—	—	88.0	—
Stonyhurst	169.2	305	e 91 18	?	e 94 30	?	e 99.0	104.2
Coimbra	169.5	221	—	—	—	—	e 98.0	—
Bidston	169.7	304	86 18	?L	99 12	?	(86.3)	107.6

Additional records: Riverview gives $iS = +7m.38s.$, $MN = +9.4m.$, $MZ = +10.2m.$, $T_0 = 13h.3m.55s.$, Epicentre $47^{\circ}5S$, $165^{\circ}0E$. La Paz $L = +78.2m.$, Toronto $L = +69.3m.$, and $eL = +72.7m.$ Ottawa $L = +75.0m.$ and $81.0m.$ Athens $L = +76.9m.$ De Bilt $MN = +90.4m.$ Epicentre $47^{\circ}5S$, $165^{\circ}0E$. San Fernando gives L as the P of another shock.

Sept. 16d. Records also at 0h. (Mizusawa (2) and San Fernando), 2h. (Taihoku and Zi-ka-wei), 4h. (Mizusawa), 5h. and 10h. (Athens), 14h. (Athens and Rocca di Papa), 15h. (Cipolletti), 17h. (La Paz), 20h. (Zi-ka-wei and Zagreb).

Sept. 17d. Records at 0h. (San Fernando), 1h. (Zagreb), 2h. (Zagreb, Rocca di Papa, Uccle, and Zurich), 5h. (Denver), 10h. (Athens and Hokoto), 13h. (Kew and Manila), 14h. (La Paz), 19h. (Batavia), 22h. (Balboa Heights).

Sept. 18d. 22h. 18m. 35s. Epicentre $21^{\circ}0N$, $120^{\circ}0E$. (as on 1918 Sept. 16d.).

$A = -.467$, $B = +.810$, $C = +.358$.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	4.3	1 7	0	(1 52)	- 6	1.8	—
Manila	6.4	e 1 31	- 7	—	—	3.1	3.6
Zi-ka-wei	10.3	2 43	+ 9	—	—	—	—
De Bilt	87.7	—	—	—	—	e 48.4	50.0
Edinburgh	89.5	50 25	?L	—	—	(50.4)	—
La Paz	171.1	e 52 31	?	—	—	—	—

Sept. 18d. Records also at 2h. (San Fernando and Rocca di Papa), 7h. (Rocca di Papa), 18h. (Taihoku (2)), 19h. (Helwan), 20h. (Mizusawa).

Sept. 19d. Records at 2h. (San Fernando, Manila (2), Riverview, and Batavia), 19h. (Batavia), 20h. (Riverview, Helwan, and Perth), 22h. (San Fernando and Mizusawa), 23h. (Taihoku).

Sept. 20d. Records at 1h. (Monte Cassino), 2h. (Zi-ka-wei and Monte Cassino), 3h. (Manila), 4h. (Zi-ka-wei, Monte Cassino, and Mizusawa), 22h. (Mizusawa).

Sept. 21d. Records at 0h. (San Fernando), 2h. (Monte Cassino), 13h. (Batavia), 15h. (Tokyo), 18h. (San Fernando).

1918. Sept. 22d. 9h. 54m. 55s. Epicentre $0^{\circ}5'N$. $100^{\circ}0'E$.

(as on 1915 April 3d.).

A = -0.174 , B = $+0.985$, C = $+0.009$; D = $+0.985$, E = $+0.174$;

G = -0.002 , H = $+0.009$, K = -1.000 .

This determination would generally be improved if a slight depth of focus were assumed, say 0.015. But as La Paz near the anticeentre gives a positive residual for [P] the evidence is not sufficiently conclusive.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Batavia	W.	9.5	134	i 2 12	-11	4 30?	+14	—	6.1
Colombo	M.	21.2	289	(5 29)	+34	(9 5)	+17	9.1	14.2
Kodaikanal	M.	24.5	295	10 29	? S	10 29)	+35	14.1	16.1
Calcutta	E. O.E.	24.7	333	5 41	+6	10 11	+14	—	—
	N. O.E.	24.7	333	5 47	+12	10 17	+20	—	—
Manila	W.	25.0	55	e 5 41	+3	10 5)	+2	10.1	—
Taihoku	O.	32.1	39	8 7	? PR ₁	11 54	-16	16.6	19.6
Bombay	O.E.	32.4	306	6 40	-12	—	—	—	—
Perth	M.	35.7	158	11 29	?	—	—	—	—
Zi-ka-wei		36.8	31	7 25	-3	13 21	0	—	23.6
Simla	O.E.	37.5	327	—	—	e 13 29	-2	—	21.8
Mauritius	N. M.	46.1	240	14 29	? S	(14 29)	-60	21.7	23.5
	E. M.	46.1	240	14 53	? S	(14 53)	-36	20.9	23.4
Osaka	O.	47.5	40	8 45	-6	—	—	—	11.6
Mizusawa	E. O.	53.8	39	9 36	+4	17 14	+8	—	—
Melbourne	M.	56.4	140	—	—	17 29	-10	30.5	32.9
Sydney	M.	59.0	131	17 47	? S	(17 47)	-24	—	—
Riverview	—	59.0	131	e 9 53	-12	i 17 51	-20	26.9	34.5
Helwan	M.	71.3	301	11 47	+22	—	—	—	44.5
Lemberg	B.O.	80.6	320	e 8 23	-240	21 59	-31	—	22.8
Cape Town	M.	83.3	236	22 35	? S	(22 35)	-25	(40.1)	45.1
Vienna	—	85.4	319	e 13 5	+15	23 35	+12	—	—
Zagreb	W.	85.5	316	i 12 47	-4	—	—	—	23.4
Pompeii	E. O.A.	86.3	311	i 12 31	-24	—	—	—	—
Pola	W.	86.9	315	e 22 59	? S	(e 22 59)	-41	e 23.3	23.6
Rocca di Papa	Ag.	87.7	312	i 12 56	-7	23 35?	-14	—	—
Moncalieri	S.	91.3	315	—	—	i 24 9	-18	50.4	—
De Bilt	N. —	92.6	321	—	—	i 24 (28)	-13	55.1	56.2
	E. —	92.6	321	—	—	—	—	58.1	61.0
Algiers	B.M.	95.3	309	—	—	e 24 2	-67	—	58.6
Edinburgh	M.	97.0	328	65 5	? L	—	—	(65.1)	68.1
Honolulu	M.	100.9	69	24 53	? S	(24 53)	-71	59.1	68.9
San Fernando	L. —	102.6	308	61 5	? L	—	—	(61.1)	83.1
Victoria	M.	119.3	31	63 56	? L	66 54	?	(63.9)	77.2
Ottawa	—	134.9	355	e 18 35	[-55]	e 34 23	?	72.1	—
Toronto	M.	136.9	359	—	—	—	—	e 83.7	84.8
Washington	Mar.	140.5	356	e 19 25	[-15]	22 35?	? PR ₁	e 80.1	—
La Paz	Bi.	160.2	215	20 16	[+8]	—	—	76.1	79.8

Additional records: Batavia gives $T_0 = 9h. 54m. 18s.$ Colombo records P as S and S as L. Zi-ka-wei PMN = $+7m. 27s.$, PME = $+7m. 31s.$, eS = $+13m. 15s.$, MN = $+24.1m.$ Mizusawa SN = $+17m. 6s.$, $T_0 = 9h. 55m. 7s.$ Riverview iS = $+17m. 54s.$, MN = $+31.6m.$, $T_0 = 9h. 54m. 54s.$ Cape Town records S as P and L as S. Victoria L = $+72.8m.$ Ottawa i = $+22m. 58s.$ (?PR₁). Toronto L at $+39.8m.$ and $+57.9m.$

Sept. 22d. 12h. 58m. 13s. } Repetitions from 46°·5N. 151°·4E. See note to
 13h. 48m. 36s. } Sept. 7d. 17h. Records at Osaka, Mizusawa,
 Ootomari, and Zi-ka-wei.

Sept. 22d. Records also at 2h. (San Fernando), 9h. (Manila), 13h. (Mizusawa, Zagreb, and Rocca di Papa), 14h. (Mizusawa, Zagreb, Rocca di Papa, Stonyhurst, Rio Tinto, and De Bilt), 17h. (Mizusawa), 19h. (Colombo), 20h. (Mizusawa).

Sept. 23d. 2h. 13m. 20s. Epicentre 36°·0N. 28°·0E. (as on 1918 Mar. 17d.).

A = +·714, B = +·380, C = +·588; D = +·470, E = -·883;
 G = +·519, H = +·276, K = -·809.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3·9	302	i 1 2	+ 1	—	—	i 1·6	2·0
Helwan	6·7	154	3 34	?L	—	—	(3·6)	—
Pompeii	11·6	298	2 54	+ 1	—	—	—	—
Rocca di Papa	13·2	301	1 10	?	—	—	—	2·1
Zagreb	13·3	321	e 3 20	+ 3	—	—	—	7·7
Pola	13·9	314	e 5 46	?S	(e 5 46)	-20	e 7·0	8·1
Stonyhurst	27·6	320	—	—	—	—	—	18·2

Zagreb eMNW = +7·4m.

Rocca seems to record another more local shock.

Sept. 23d. Records also at 1h. (Manila), 3h. (Zagreb), 12h. (La Paz and Mizusawa), 13h. (Helwan), 17h. (Apia), 20h. (Mizusawa), 21h. (Helwan), 22h. (San Fernando).

Sept. 24d. 0h. 3m. 8s. Epicentre 24°·0N. 121°·0E. (as on 1916 Nov. 14d.).

A = -·470, B = +·783, C = +·407; D = +·857, E = +·515;
 G = -·210, H = +·349, K = -·914.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1·1	24	0 17	0	—	—	0·7	—
Hokoto	1·5	251	—	—	0 40	- 2	0·9	1·1
Zi-ka-wei	7·2	3	—	—	—	—	e 4·9	—
Manila	9·4	180	—	—	e 4 12	- 1	—	—
De Bilt	85·6	326	—	—	—	—	e 46·9	47·6
Edinburgh	86·8	332	48 22	?L	—	—	(48·4)	50·9
Eskdalemuir	87·5	332	—	—	—	—	45·9	—
Stonyhurst	88·2	330	—	—	—	—	—	52·4

De Bilt gives MN = +47·4m.

Sept. 24d. Records also at 4h. (Tokyo), 6h. (Manila), 8h. and 9h. (Athens), 13h. (Tokyo).

Sept. 25d. 9h. 52m. 20s. Epicentre 16°·0S. 168°·0E. (as on 1917 Nov. 29d.).

A = -·940, B = +·200, C = -·276; D = +·208, E = +·978;
 G = +·270, H = -·057, K = -·961.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	23·4	210	e 5 20	- 1	9 26	- 7	e 11·1	16·7
Melbourne	29·8	218	—	—	11 16	-15	14·6	17·7
Honolulu	50·1	43	e 16 40	?S	(e 16 40)	+20	25·7	30·7
San Fernando	158·9	347	63 40	?L	—	—	(63·7)	—

Riverview gives also S = +9m.20s. and MN = +16·2m.

Sept. 25d. Records also at 4h. (San Fernando), 9h. (Mizusawa, Tokyo, and Osaka), 11h. (Helwan), 13h. (Rio Tinto), 17h. (Mizusawa), 20h. (Helwan).

Sept. 26d. 0h. 16m. 25s. Epicentre $46^{\circ}0'N$. $9^{\circ}0'E$. (as on 1917 Dec. 9d.).

$$A = +.686, B = +.109, C = +.719.$$

		Δ	P.	O-C.	S.	O-C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Milan		0.6	0 52	+43	—	—	—	1.4
Zurich	E.	1.4	1 0 26	+ 5	1 0 42	+ 3	—	0.7
	V.	1.4	0 26	+ 5	0 43	+ 4	—	1.0
Paris		5.2	e 2 20	?S	(e 2 20)	- 2	3.3	—
Uccle		5.7	e 1 23	- 5	—	—	e 2.9	—
Zagreb		5.9	i 1 30	- 1	2 20	-21	—	2.5

Additional records: Zurich gives MN = +0.8m., MV = +1.0m. Neuchatel
P = +47s., S = +1m.18s., T_0 = 0h.16m.33s. Paris iS = +3m.5s. Zagreb
eP = +1m.24s., MNW = +2.6m.

Sept. 26d. Records also at 11h. (La Paz), 13h. and 17h. (Pompeii), 23h. (La Paz).

Sept. 27d. Records at 0h. (Mizusawa), 1h. (San Fernando), 2h. (Helwan and Edinburgh), 3h. (Lick), 5h. (Nagasaki, Helwan, Cape Town, Algiers, and De Bilt), 9h. (Monte Cassino), 11h. (Taihoku), 12h. (Tortosa), 15h. (De Bilt), 22h. (San Fernando).

Sept. 28d. 10h. 19m. 30s. I } At $26^{\circ}0'S$. $80^{\circ}0'W$. (as on 1917 Feb. 15, 16, 21).
10h. 35m. 20s. II }

$$A = +.156, B = -.886, C = -.438; \quad D = -.985, E = -.174; \\ G = -.076, H = +.431, K = -.899.$$

The South American stations (except La Paz) use Cordoba time, 4h. 16m. 48.22s. W. of Greenwich. If for some reason they have in this case used standard time (4h. 0m. 0s. W.) the two shocks might coalesce into one.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
II Andalgala	12.3	101	3 40	+37	12 52	?	—	16.3
II La Quiaca	13.6	77	—	—	—	—	—	4.5
I La Paz	14.5	52	3 25	- 8	6 21	+ 1	7.9	8.5
II Cipoletti	16.4	145	4 4	+ 7	6 22	-42	—	7.9
I Victoria	83.9	333	37 0	?L	—	—	(37.0)	39.9
I Honolulu	89.2	294	—	—	—	—	—	37.7
I Rio Tinto	93.8	49	50 30	?L	—	—	(50.5)	58.0
I Algiers	100.1	54	—	—	—	—	—	48.5
I Edinburgh	104.3	34	6 30	?	—	—	—	51.5
I Moncalieri	106.6	48	e 51 1	?	—	—	53.3	—
I Helwan	120.2	68	28 30	?S	(28 30)	-21	—	—

II La Quiaca gives MN = +4.0m.

Sept. 28d. Records also at 4h. (Denver), 11h. (Kodaikanal), 16h. (Moncalieri), 23h. (San Fernando).

1918. Sept. 29d. 12h. 7m. 5s. Epicentre 35°2N. 34°7E.

A = +.672, B = +.465, C = +.576; D = +.569, E = -.822;
G = +.474, H = +.328, K = -.817.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.	
		°	°	M. S.	S.	M. S.	S.	M.	M.	
Helwan	M.	6.0	209	1 43	+11	—	—	—	8.1	
Athens	M.	9.2	291	2 28	+9	4 20	+12	5.0	7.6	
Lemberg	B.O.	16.6	335	e 4 7?	+7	7 25	+16	—	10.8	
Pompeii	O.A.	16.8	295	3 45	-17	e 6 56	-17	10.4	—	
Monte Cassino	Ag.	17.5	298	4 11	0	—	—	—	4.8	
Zagreb	W.	17.7	312	i 4 22	+9	i 7 48	+15	e 8.9	10.6	
Rocca di Papa	Ag.	18.4	298	i 4 30	+8	i 8 3	+14	e 11.4	15.2	
Pola	W.	18.5	308	e 4 16	-7	e 7 49	-2	e 9.8	13.7	
Milan	Ag.	21.9	306	5 11	+7	—	—	—	11.9	
Moncalieri	S.	22.7	304	5 16	+3	i 9 38	+19	12.9	18.1	
Zurich	—	22.9	310	e 5 17	+1	9 33	+10	—	—	
Marseilles	Ma.	24.0	299	i 5 37	+9	i 9 52	+8	17.9	—	
Algiers	B.M.	25.5	283	5 42	-1	10 22	+9	12.4	23.9	
Barcelona	—	26.1	294	5 49	0	10 30	+6	—	20.9	
De Bilt	—	26.9	318	5 57	0	10 37	-2	12.9	15.4	
Uccle	—	26.9	315	5 53	-4	10 32	-7	e 13.9	19.6	
Paris	—	27.2	310	e 5 55	-5	i 10 33	-12	13.9	18.4	
Kew	M.	29.7	314	10 55	?S	(10 55)	-34	—	22.9	
Shide	—	30.1	310	6 23	-6	11 53	+17	17.9	21.5	
Stonyhurst	M.	31.8	315	7 25	+40	12 49	+44	—	25.5	
Bidston	M.S.	32.0	315	6 55	+8	12 1	-7	—	20.4	
Eskdalemuir	G.	32.8	320	6 47	-8	12 5	-16	15.9	18.5	
San Fernando	—	32.9	282	6 55	-1	(11 25)	-57	11.4	31.9	
Dyce	M.S.	33.0	323	6 36	-20	11 55	-29	17.8	28.2	
Edinburgh	M.	33.0	321	6 45	-11	—	—	—	24.6	
Rio Tinto	M.	33.0	288	5 55	-61	—	—	—	30.9	
Coimbra	E.	34.2	292	7 3	-4	12 36	-7	20.9	26.6	
—	N.	34.2	292	7 19	+12	—	—	15.7	24.6	
Cork	—	34.8	312	12 55	?S	(12 55)	+3	—	25.4	
Simla	O.E.	35.5	85	12 13	?S	(12 13)	-50	18.5	19.1	
Bombay	O.E.	37.4	109	7 10	-23	—	—	—	23.4	
Kodaikanal	M.	46.2	112	19 49	?SR ₁	—	—	28.8	31.6	
Colombo	M.	50.1	116	15 25	?S	(15 25)	-55	—	36.2	
Mauritius	N.	M.	59.5	156	25 43	?I.	—	(25.7)	33.6	
—	E.	M.	59.5	156	18 13	?S	(18 13)	-4	32.7	
Zi-ka-wei	—	70.2	65	e 22 35	?	—	—	—	41.8	
Cape Town	M.	70.7	194	28 55	?	36 55	?	39.9	41.9	
Ottawa	—	77.8	319	12 12	+6	22 8	+10	e 35.9	—	
Osaka	O.	78.3	56	10 35	?	22 1	-3	32.4	43.1	
Manila	W.	78.7	80	e 12 31	+20	22 0	-8	22.0	22.4	
Batavia	W.	79.2	106	e 11 55	-19	—	—	e 45.9	24.9	
Ithaca	B.O.	80.2	317	—	—	—	—	e 39.3	—	
Toronto	M.	81.0	320	—	—	23 7?	-32	37.0	50.4	
Georgetown	E.	82.7	314	e 11 54	-40	22 54	0	—	—	
—	N.	82.7	314	e 11 54	-40	22 58	+4	—	—	
Washington	Mar.	82.7	314	e 12 50	+16	12 50	?P	e 39.9	—	
Ann Arbor	N.	W.	84.2	320	12 37	-6	21 55	-75	34.9?	22.9
—	E.	W.	84.2	320	12 25	-18	21 55	-75	—	22.8
Victoria	M.	94.2	348	—	—	—	—	e 45.0	59.8	
Perth	M.	101.4	122	—	—	—	—	48.9	—	
La Paz	Bi.	109.7	265	e 19 2	?PR ₁	29 39?	—	55.9	58.7	
Melbourne	M.	125.2	116	—	—	—	—	69.4	74.4	
Riverview	—	128.6	110	e 57 31?	?	—	—	68.1	74.8	
Sydney	M.	128.6	110	—	—	68 7	?I.	(66.1)	—	

Additional records: Athens gives MN = +7.4m. Zagreb is = +7m.52s., M = +13.5m. Pola MN = +11.6m. Moncalieri MN = +15.8m. Zurich i = -5m.33s. De Bilt MN = +15.6m., T₀ = 12h.7m.9s. Uccle SR₁ = +12m.43s. Paris MN = +16.3m. San Fernando MN = +29.4m. Coimbra T₀ = 12h.7m.9s. Simla S = +14m.55s. All these records are given for 13h. Ottawa L = +47.9m., T₀ = 12h.7m.19s. Osaka MN = +42.1m. Manila S = +18m.7s. (?PR₁). MN = +22.1m. Batavia eL = +45.9m., L = +50.9m. Toronto e = +27m.55s., eL = +47.2m., and +49.8m. Washington e? = +11m.55s. Ann Arbor gives, with the Bosch instrument, PE = 12m.13s. Victoria eL = 43.3m., and +50.0m. La Paz adds a note "Probably 5 secs. in error." Riverview MN = +72.4m. MZ = +77.3m.

Sept. 29d. Records also at 0h. (Tokyo, Rocca di Papa, Zagreb, and Athens),
12h. (Taihoku), 14h. (Zurich and La Paz), 23h. (San Fernando).

Sept. 30d. 7h. 28m. 5s. Epicentre $35^{\circ}0'N$, $24^{\circ}0'E$. (as on 1913 Sept. 30d.).

$$A = +.748, B = +.333, C = +.574; \quad D = +.407, E = -.914;$$

$$G = +.524, H = -.233, K = -.819.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	2.9	356	i 0 42	- 3	—	—	1.0	1.2
Pompeii	9.4	310	e 2 24	+ 2	e 4 16	+ 3	—	—
Rocca di Papa	11.1	311	e 2 47	+ 1	+ 55?	- 2	—	5.6
Zagreb	12.5	332	e 2 53	-13	i 5 38	+ 6	i 6.5	7.9
N.W.	12.5	332	e 2 58	- 8	—	—	—	7.4
N.E.	12.5	325	e 0 55	?	—	—	—	—
Pola	15.9	314	e 4 41?	+50	8 16?	+83	11.1	—
Moncalieri	21.7	328	—	—	e 8 55	- 4	e 11.6	12.6
De Bilt								

Additional records: Athens gives $m = +46s$. Rocca di Papa $e = +2m.24s$.
Zagreb $iMNE = +6m.50s$, $MNE = -6.9m$.

1918. Sept. 30d. 13h. 34m. 20s. Epicentre $51^{\circ}0'N$, $179^{\circ}5'W$.

$$A = -.629, B = -.005, C = +.777; \quad D = -.009, E = +1.000;$$

$$G = -.777, H = -.007, K = -.629.$$

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Honolulu	M.	34.1	142	e 7 52	+46	12 16	-26	13.7	14.7
Victoria	M.	35.6	73	(7 13)	- 5	(10 10)	-174	(15.1)	(31.3)
Osaka	O.	36.1	262	7 16	- 7	—	—	—	18.0
Berkeley	—	41.7	86	e 17 40	?	—	—	—	—
Zi-ka-wei	—	47.2	270	9 4	+16	16 10	+26	—	—
Manila	W.	59.7	259	e 17 24	? 8	(17 24)	-55	19.7	—
St. Louis	W.	60.6	65	12 40	+144	18 22?	- 9	22.2	33.8
Toronto	M.	62.8	53	10 40?	+ 9	e 19 22	+24	e 27.7	42.2
Ottawa	—	63.4	50	10 30	- 4	18 50	-16	29.2	—
Ithaca	n. B.O.	65.2	52	e 10 30	-16	18 47	-40	34.6	—
Northfield	B.O.	65.8	49	—	—	—	—	e 38.6	—
Washington	Mar.	67.5	56	10 25	-36	19 3	-53	40.7	—
Georgetown	—	67.5	56	—	—	e 33 23	? L	37.3	—
Cheltenham	n. B.O.	67.7	56	e 38 5	?	—	—	40.6	41.6
Harvard	B.O.	67.8	50	(10 39)	-24	—	—	34.0	—
Edinburgh	M.	73.0	3	12 40	+64	—	—	—	—
Eskdalemuir	G.	73.6	3	11 45	+ 5	21 10	+ 1	35.6	—
Bidston	M.S.	75.5	2	11 58	+ 6	20 46	-46	—	30.4
De Bilt	—	76.8	357	11 (59)	- 1	21 (54)	+ 7	e 36.6	40.5
Kew	M.	77.5	0	—	—	—	—	—	55.6
Uccle	—	78.1	358	—	—	e 21 40	-21	e 39.6	50.6
Shide	M.S.	78.3	1	—	—	23 10	+66	39.7	—
Paris	—	80.2	359	—	—	e 22 40	+15	42.6	50.6
Zagreb	W.	82.2	350	e 12 50	+19	e 22 48	0	43.6	49.6
Moncalieri	S.	83.8	355	12 47	+ 6	22 55	-12	35.6	48.3
Batavia	W.	84.6	257	—	—	e 22 40	-35	—	—
Rocca di Papa	Ag.	86.6	351	13 52	+55	23 52	+15	45.5	60.0
Coimbra	—	88.4	7	e 13 12	- 5	23 30	-26	43.1	—
Riverview	—	88.7	204	e 13 5	- 4	i 23 37	-23	e 43.8	49.2
Algiers	B.M.	92.2	358	—	—	e 23 51	-46	—	26.2
San Fernando	—	92.4	5	40 40	? L	—	—	40.7	54.7
Helwan	M.	94.7	334	—	—	24 40	-23	—	—
La Paz	Bi.	116.2	84	19 44	PR ₁	—	—	71.6	74.8
Cape Town	M.	158.5	316	84 10	? L	93 40	? L	(84.2)	97.7

For Notes see next page.

NOTES TO SEPT. 30d. 13h. 34m. 20s.

Victoria gives $P = 13h.31m.33s.$, $S = 13h.34m.30s.$, $L = 13h.39m.25s.$, $M = 13h.55m.39s.$, $\Delta = 1710$, which probably refers to an earlier shock, though no other observatory (except possibly Harvard) seems to record it. An attempt is made in the text to reconcile the readings by assuming an error of 10min., but without much success. Osaka gives $MN = +18.3m.$. Toronto $L = +56.5m.$. Ottawa $L = +37.6m.$, &c. Ithaca $PE = +8m.50s.$. Washington $L = +35.7m.$. Georgetown $LN = +37.5m.$. Ann Arbor ($\Delta = 61^{\circ}.6$) gives 14h. to 14h.30m. Harvard gives P as SE, with $SN = +10m.38s.$, $eLN = -31.0m.$, $LE = +34.6m.$, $LE = +39.8m.$, $\Delta = 10155$, misreading the shock as a very distant one. Eskdalemuir $PR_1 = +14m.59s.$, $SR_1 = +26m.0s.$. De Bilt $NSR_1 = +27m.10s.$, $m = +27m.30s.$, $MN = +38.2m.$, $T_0 = 13h.34m.22s.$, Epicentre $51^{\circ}.6N.$ $176^{\circ}.2W.$. Moncalieri $MN = +46.5m.$, ME as printed would be $+28.3m.$. Riverview $e? = +17m.34s. = PR_1?$ $PS = +24m.8s.$, $MN = +45.1m.$, $T_0 = 13h.34m.51s.$ San Fernando, the M is given at 19h. instead of 14h.

Sept. 30d. 16h. 8m. 45s. Epicentre $46^{\circ}.5N.$ $151^{\circ}.4E.$ (as on 1918 Sept. 8d. 5h.).

This seems to be a repetition of Sept. 8d. 5h., with focus at normal depth, rather than of Sept. 7d. 17h., with high focus. Direct comparison of the observations favours this view.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Ootomari	5.9	285	1 52	+21	—	—	3.6	—
Mizusawa	10.5	229	2 29	-8	4 34	-9	—	—
Osaka	16.8	231	4 13	+11	—	—	—	13.4
Zi-ka-wei	27.6	247	e 5 54	-10	—	—	—	—
Honolulu	47.9	104	15 33	?S	(15 33)	-20	26.0	29.3
Eskdalemuir	75.9	345	—	—	—	—	41.3	—
De Bilt	E. 77.3	340	—	—	e 22 1	+9	e 43.3	45.3
	N. 77.3	340	—	—	—	—	e 42.3	52.6
Hohenheim	79.2	336	i 12 7	-7	—	—	—	—
Zagreb	79.7	330	e 12 17	0	e 22 16?	-4	45.3	—
Paris	80.9	340	—	—	—	—	e 45.3	—
Moncalieri	83.1	335	e 41 2	?L	—	—	47.9	—
Rocca di Papa	84.4	330	12 39?	-5	23 9?	-3	—	25.7
Cape Town	142.5	273	45 15	?SR ₁	—	—	—	—

Additional records: Mizusawa $NS = +3m.3s.$ Osaka $MN = +15.0m.$
Zagreb $eNE? = +12m.7s.$ Rocca di Papa $i = +25m.3s.$, $eL = +35.8m.$,
 $M = +58m.$, &c.

1918. Sept. 30d. 17h. 51m. 35s. Epicentre $24^{\circ}.0S.$ $171^{\circ}.6E.$

$A = -.904$, $B = +.133$, $C = -.407$; $D = +.146$, $E = +.989$;
 $G = +.402$, $H = -.059$, $K = -.914$.

The epicentric residuals suggest an increase of T_0 by about 10sec., in which case the anticentric residuals become distinctly negative and suggest a focus rather deeper than usual.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Apia	W.	18.7	60	4 26	+1	(7 53)	-2	e 7.9	9.4
Sydney	M.	20.3	236	4 55	+10	8 37	+8	10.2	10.9
Riverview	—	20.4	236	i 4 48	+2	8 28	-4	9.8	10.3
Melbourne	M.	26.6	232	6 7	+13	(10 25)	-8	10.4	15.6
Adelaide	M.	30.7	242	6 22	-13	11 27	-19	15.9	18.4
Perth	M.	49.4	248	8 55	-8	15 54	-17	26.9	32.5
Honolulu	M.	54.1	36	17 7	?S	(17 7)	-3	27.5	33.9
Manila	W.	62.8	303	e 10 37	+6	(19 3)	+5	19.0	19.7
Batavia	W.	64.5	275	10 42	0	19 15?	-4	e 34.4	36.4
Osaka	O.	68.0	329	11 3	-1	—	—	—	21.0
Mizusawa	E. O.	69.3	336	11 9	-4	20 8	-10	—	—
	N. O.	69.3	336	12 13	+60	20 7	-11	—	—
Zi-ka-wei	—	73.2	319	11 39	+2	20 56	-8	—	—
Berkeley	—	87.5	46	—	—	—	—	e 36.2	—

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Lick	W.	87.6	48	—	—	—	—	e 36.4	—
Victoria	M.	92.8	39	12 57	-34	17 22	? PR ₁	23.9	55.7
Colombo	M.	94.5	275	23 25	?	—	—	—	—
Cipolletti	M.	95.9	139	—	—	—	—	—	63.8
Mauritius	N.	M.	101.9	239	26 43	? S	26 43	+29	—
	E.	M.	101.9	239	25 1	? S	(25 1)	-73	50.2
Bombay	O.E.	105.3	283	23 37	?	—	—	—	58.5
La Paz	Bi.	109.0	119	e 18 51	? PR ₁	28 48	+89	—	—
Toronto	M.	119.7	50	—	—	e 52 25	?	61.2	70.8
Washington	Mar.	120.9	58	—	—	—	—	e 53.4?	—
Georgetown	—	120.9	58	—	—	—	—	65.1	—
Ithaca	B.O.	121.7	51	—	—	—	—	e 63.9	—
Ottawa	—	122.6	48	—	—	—	—	61.4	—
Harvard	B.O.	125.7	51	—	—	—	—	64.7	—
Eskdalemuir	G.	148.5	355	19 55	[+ 1	30 11	-99	48.4	—
Vienna	—	148.9	328	i 19 54	[0]	—	—	—	—
De Bilt	F.	150.1	342	—	—	e 30 23	?	e 75.4	110.8
	N.	150.1	342	—	—	—	—	e 74.4	117.8
Bidston	M.S.	150.3	352	19 49	- 7	29 55	?	—	91.9
Zagreb	W.	150.6	323	e 19 51	[- 6]	30 20	?	42.4	—
Uccle	—	151.5	343	e 19 55	- 3	e 30 25	?	—	30.4
Hohenheim	—	151.6	335	e 19 47	[-11]	—	—	—	—
Shide	M.S.	152.7	351	—	—	—	—	86.8	—
Zurich	—	153.0	334	e 19 56	[- 4]	—	—	—	—
Paris	—	153.7	344	—	—	30 40	?	79.4	93.4
Rocca di Papa	Ag.	155.1	320	19 36	[-26]	—	—	—	—
	Ag.	155.1	320	e 20 8	[+ 6]	e 37 16?	?	90.6	97.3
Moncalieri	S.	155.3	332	20 5	[+ 3]	—	—	33.3	—
Tortosa	—	161.6	338	20 25	[+16]	31 16	?	92.4	107.6
Coimbra	—	163.8	0	—	—	e 34 25	?	e 50.9	—
Algiers	B.M.	163.9	325	e 20 12	[+ 1]	29 45	?	45.4	107.4

Additional records: Riverview gives $eP = +4m.42s.$, $iP = +5m.12s.$, $PS = +8m.47s.$, $MN = +10.9m.$, $MZ = +11.8m.$, $T_0 = 17h.51m.25s.$ Epicentre $24^\circ 0S.$, $172^\circ 5E.$ Melbourne P as S and S as $L.$ Honolulu $S = -22m.55s.$ Manila gives $S = 15m.49s.$ PR_1 . Batavia $M = -20.4m.$ Osaka $MN = +25.0m.$ Zi-ka-wei $SMN = +21m.44s.$ Toronto $eL = +65.0m.$ Washington $L = +68.4m.$ and $+104.4m.$ Ottawa $eLN = +50.4m.$, $LN = +53.4m.$ De Bilt gives $24^\circ 0S.$, $172^\circ 5E.$, as an estimation of the epicentre. Zagreb gives an alternative to P , $iP = +20m.1s.$ Rocca di Papa $eL = +44.6m.$

Sept. 30d. 18h. 37m. 50s. Epicentre $7^\circ 0S.$, $145^\circ 0E.$ (as on 1918 June 4d.).

$$A = -.813, B = -.569, C = -.122; \quad D = +.574, E = +.819; \\ G = +.100, H = -.070, K = -.993.$$

We could improve the accordance of Batavia, Honolulu, and Apia (assuming an error of 2min. in this last) by moving the epicentre 5° further east to $7^\circ 0S.$, $150^\circ 0E.$, but this would not suit Manila so well.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	27.4	169	e 5 51	-11	1 10 48	0	e 14.0	18.2
Sydney	27.4	169	9 58	? S	(9 58)	-50	15.8	16.7
Adelaide	28.5	191	4 10	-123	8 47?	-141	12.5	21.9
Melbourne	30.7	180	9 28	+173	15 4	+198	18.5	19.6
Manila	32.2	312	e 7 2	-12	12 0	-11	14.8	15.6
Perth	36.9	224	—	—	—	—	24.0	—
Batavia	37.9	269	e 8 20	+43	16 26?	+169	—	—
Osaka	42.7	348	8 23	- 7	—	—	—	28.2
Apia	43.0	103	5 38?	-160	—	—	16.7	22.2
Zi-ka-wei	44.3	331	8 10?	-18	e 15 1	- 5	—	30.0
Honolulu	62.6	62	17 40	? S	(17 40)	-76	27.5	32.2
Victoria	96.4	42	—	—	—	—	38.0	43.1

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Cape Town	114.9	229	—	—	—	—	—	67.7
Zagreb	121.6	321	17 27	?	e 33 10	?	—	46.2
Cipolletti	124.7	147	—	—	—	—	—	78.1
Rocca di Papa	125.4	318	12 40?	?	23 10	?	44.4	54.5
Toronto	126.6	39	—	—	—	—	e 64.8	75.2
Moncalieri	127.0	323	20 17	[+66]	—	—	35.8	50.9
Kew	127.1	332	—	—	32 10	?	—	41.8
Washington	130.5	43	—	—	—	—	58.2	—
Harvard	132.4	36	—	—	—	—	71.3	—
Barcelona	132.4	322	—	—	—	—	e 42.8	55.2
Andalgala	134.3	140	—	—	—	—	—	91.5
La Paz	139.5	126	19 20	[-18]	32 10	?	57.2	63.9
Rio Tinto	139.9	321	44 10	?	—	—	—	71.2

Additional records: Riverview gives PS = +11m.21s., MN and MZ = +15.8m., T_a = 18h.37m.27s. Sydney gives S = +13m.40s. = L? corrected. Melbourne SR_1 = +16m.28s., SR_2 = +17m.10s. Manila MN = +15.2m. Osaka MN = +32.6m. Zi-ka-weig gives P at 18h.6m.0s. It is assumed that 6m. should be 46m. Kodaikanal ($\Delta = 70^{\circ}$) gives P at 18h.41m.48s., L at 18h.48m.12s., M at 18h. 54.1m., which probably apply to previous earthquake. Ann Arbor ($\Delta = 114^{\circ}.7$) gives 19h. to 20h. Toronto eL = +71.2m., iL = +79.2m. Washington L = +22.2m. Andalgala ME = +27.2m., MN = +30.4m., possibly 1h. wrong. Rio Tinto gives M = +79.2m.

Sept. 30d. Records also at 1h. (Harvard and Athens), 3h. (Athens), 4h. (Simla and Athens (2)), 7h. (Athens), 8h. (Athens (2)), 9h. (Athens and Batavia), 10h. (Riverview and Athens), 13h. (Rocca di Papa and Adelaide), 14h. (Batavia), 16h. (Athens), 17h. (Lick), 19h. (Zagreb), 20h. (Zurich), 23h. (Lick).

The International Seismological Summary for 1918 (Continued).

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number contains the information for October, November, and December 1918, and thus concludes the first year of the International Summary—the successor to the *Slide* and *Oxford Bulletins*.

It seems desirable to repeat some of the information as to procedure, but this will be more conveniently placed at the end of the year. Hence the reader is referred to the Notes at the end of this number for such information; also for some records which arrived too late for inclusion in the earlier numbers, and for discussions of some points of interest, such as the laws governing the repetition of shocks from the same focus.

It is doubtful whether a final or standard method of presentation of the results has yet been reached. As the work progresses, and new light is thrown on the whole subject, it is inevitable that more should be possible by way of inference than at first. This is chiefly true of the shocks only imperfectly recorded. At first there was no guidance for them, except the actual records, which were inconclusive; but a number of epicentres have now been recognised from which repetitions may be expected; so that, to put an extreme supposition, if the imperfect information about a new shock only suffices to refer it vaguely to a large area which nevertheless contains an old epicentre (and only one), the new shock may be confidently attributed (as a first approximation, at any rate) to this known position. On the other hand, there seem to be also *preliminary* feeble shocks which herald much greater ones. For the latter a good epicentre can readily be determined; and it is then possible to return to the rough determination of the feebler shock formerly adventured and to give it precision. Experience suggests that a good deal of revision of earlier results in this way might be advantageous; but it seems better for the present to press forward to the years 1919-1922, for which the material is already accumulated.

H. H. TURNER.

University Observatory, Oxford,
1923 October 23rd.

1918 OCTOBER, NOVEMBER, & DECEMBER.

Oct. 1d. 0h. 20m. 15s. Epicentre $30^{\circ}0'N$. $174^{\circ}0'W$.

$$A = -.861, B = -.091, C = +.500; \quad D = -.104, E = +.995; \\ G = -.497, H = -.052, K = -.866.$$

Both this and the following determination are very unsatisfactory, but they may serve to show the difficulties in reconciling all the records on the hypothesis of a single shock.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Honolulu	16.7	117	(3 3)	-58	—	—	3.0	12.6
Tokyo	38.9	290	7 46	+ 1	13 52	+ 1	17.7	—
Victoria	42.4	50	—	—	—	—	59.5	65.9
Riverview	71.9	210	—	—	e 34 45	?	e 39.6	45.0
Toronto	72.8	50	—	—	—	—	e 78.2	84.9
Melbourne	77.9	212	—	—	—	—	37.8	40.0
Adelaide	78.9	219	—	—	—	—	—	40.9
Batavia	83.8	261	38 41	?L	38 54	?L	(38.7)	40.8
Colombo	100.4	283	74 45	?L	—	—	(74.8)	80.8
Cape Town	168.7	246	100 45	?L	—	—	(100.8)	101.8

Additional records: Honolulu gives its records under 1h. instead of 0h., also
e = +1m.45s. Riverview MN = +46.0m. Toronto eL = +81.8m.

Oct. 1d. 1h. 9m. 30s. Epicentre $14^{\circ}0'S$. $85^{\circ}0'E$.

$$A = +.085, B = +.966, C = -.242; \quad D = +.996, E = -.087; \\ G = -.021, H = -.241, K = -.970.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Kodaikanal	25.4	342	6 24	+42	—	—	20.7	20.7
Mauritius	26.5	253	10 42	?S	(10 42)	+10	—	—
Bombay	35.0	340	12 55	?S	(12 55)	0	—	17.2
Calcutta	36.7	7	15 12	?SR ₁	18 12	?L	(18.2)	—
Dehra Dun	44.8	352	9 30	+58	—	—	—	—
Simla	45.7	351	e 10 18	?PR ₁	—	—	—	13.3
Zi-ka-wei	57.2	39	9 57	+ 4	e 17 48	- 1	e 32.1	35.8
Helwan	67.8	313	21 48	?S	(21 48)	+108	—	28.3
Zagreb	86.0	321	e 12 29	-24	e 22 38	+52	51.8	—
Rocca di Papa	86.6	316	12 55	- 2	—	—	—	13.6
Moncalieri	91.1	318	—	—	e 21 3	-202	36.0	—
De Bilt	94.9	323	—	—	e 21 30	-215	e 33.5	36.6
Uccle	95.0	322	e 12 0	-103	—	—	—	39.5
Paris	95.9	320	—	—	e 21 58	-197	37.5	—
Shide	98.4	321	—	—	e 21 41	?	38.6	45.3
Stonyhurst	99.8	322	e 21 48	?	e 29 54	?	e 41.6	43.6
Edinburgh	100.5	325	15 30	+77	—	—	—	44.5

No additional records.

Oct. 1d. Records also at 0h. (Ottawa), 8h. (Kodaikanal), 12h. (Batavia), 21h. (San Fernando), 23h. (Lick).

Oct. 2d. 0h. 20m. 10s. Epicentre $5^{\circ}0'S$. $142^{\circ}0'E$.

$A = -.785$, $B = +.613$, $C = -.087$; $D = +.616$, $E = +.788$;
 $G = +.069$, $H = -.054$, $K = -.996$.

On direct comparison with 1918 July 3d. (adopted epicentre $3^{\circ}5'S$. $142^{\circ}0'E$.), some stations agree so well as to suggest identical origin; but others differ considerably.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	30.1	166	e 6 28	- 1	i 11 34	- 2	e 13.9	14.7
Adelaide	30.1	185	6 25	- 4	10 30	-66	14.6	17.8
Sydney	30.1	166	4 50	?	10 20	-76	14.1	15.3
Melbourne	32.9	176	—	—	13 14	+52	20.6	21.6
Batavia	35.0	268	4 50	?	—	—	—	14.8
Perth, W.A.	36.4	220	7 26	+ 1	13 3	-11	21.5	24.1
Osaka	40.1	350	7 40	-16	(13 48)	-20	13.8	15.0
Kobe	40.2	350	e 7 43	-14	—	—	12.4	14.7
Zi-ka-wei	41.2	332	i 8 0	- 5	—	—	—	—
Mizusawa	E. 44.1	358	8 6	-21	14 39	-24	—	—
	N. 44.1	358	8 4	-23	14 40	-23	—	—
Honolulu	64.3	61	e 11 38	+58	18 32	-45	25.7	36.3
Mauritius	82.7	250	44 44	?L	—	—	(44.7)	48.0
Victoria	96.8	41	25 14?	?S	(25 14?)	-10	—	61.6
Helwan	110.4	300	19 50	?PR ₁	—	—	—	—
Cape Town	114.1	229	60 50	?L	—	—	(60.8)	63.3
De Bilt	121.0	331	—	—	29 50	+53	e 59.8	61.9
Rocca di Papa	121.9	319	i 18 56	?	32 20?	?	e 76.2	—
Edinburgh	122.1	340	28 50	?S	(28 50)	-15	—	—
Eskdalemuir	122.5	339	—	—	—	—	57.8	—
Stonyhurst	123.3	335	—	—	—	—	—	68.2
Bidston	123.8	335	49 50	?L	—	—	(49.8)	61.8
Paris	124.3	330	—	—	e 34 50	?SR ₁	63.8	—
Toronto	126.9	36	—	—	—	—	76.9?	—
La Paz	143.2	126	19 24	[-21]	—	—	—	—

Additional records: Riverview gives $i = +6m.37s.$, $MN = +15.1m.$, $MZ = +18.9m.$, $T_0 = 0h.20m.11s.$ Adelaide $SR_1 = +11m.55s.$ Melbourne $SR_1 = +16m.20s.$ Osaka $MN = +14.9m.$ Mizusawa $T_0 = 0h.19m.55s.$

Oct. 2d. 13h. 22m. 27s. Epicentre $13^{\circ}0'N$. $123^{\circ}0'E$. (as on 1917 Sept. 7d.).

$A = -.531$, $B = +.817$, $C = +.225$; $D = +.839$, $E = +.545$;
 $G = +.123$, $H = -.189$, $K = -.974$.

	Δ	Az.	P.	O-C.	S.	O-C.	M.
			m. s.	s.	m. s.	s.	m.
Manila	2.6	309	i 0 47	+ 6	—	—	—
Zi-ka-wei	18.2	356	i 4 17	- 2	i 7 44	0	—
Osaka	24.4	26	5 35	+ 3	—	—	13.5
Batavia	25.1	221	e 5 33	- 6	—	—	10.6

Osaka gives $MN = +12.8m.$

Oct. 2d. Records also at 7h. (De Bilt and Athens), 11h. (Athens and La Paz), 14h. (Denver), 22h. (San Fernando).

Oct. 3d. Records at 0h. (Helwan), 1h. (Mizusawa and Tokyo), 7h. (Riverview and Melbourne), 8h. (Helwan, Rocca di Papa, Pompeii, Edinburgh, and Taihoku), 9h. (Zi-ka-wei), 14h. (Manila and Monte Cassino), 22h. (San Fernando).

Oct. 4d. Records at 1h. (Eskdalemuir, Edinburgh, and De Bilt), 2h. (Algiers, Osaka, Kew, Helwan, Tokyo, Stonyhurst, Mizusawa, and Kobe), 4h. (Melbourne, La Paz, and Riverview), 6h. (Taihoku and Helwan), 7h. (Mauritius), 8h. (La Paz), 9h. (Georgetown, Washington, Lawrence, St. Louis, Ithaca, and Cheltenham), 14h. (La Paz), 21h. (San Fernando).

Oct. 5d. Records at 4h. (Bidston), 6h. (Rocca di Papa (2)), 10h. (Batavia), 21h. (Colombo), 22h. (San Fernando).

Oct. 6d. Records at 0h. (La Paz). 2h. (Melbourne, Perth, W.A., and Riverview), 3h. (San Fernando and Helwan), 12h. (Manila and San Fernando), 15h. (La Paz); 20h. (Honolulu and Mizusawa), 21h. (Nagasaki).

Oct. 7d. Records at 8h. (Monte Cassino), 10h. (Manila), 12h. (Tokyo), 14h. (La Paz).

Oct. 8d. Records at 1h. (Zi-ka-wei, Taihoku, and San Fernando), 6h. (Mizusawa), 8h. (Mizusawa and Tokyo), 11h. (Rocca di Papa and Monte Cassino), 21h. (Mizusawa).

Oct. 9d. 9h. 17m. 40s. Epicentre $7^{\circ}5S$, $121^{\circ}5E$.

$$A = -.518, B = +.846, C = -.130; \quad D = +.853, E = +.522; \\ G = +.068, H = -.111, K = -.991.$$

The residuals suggest that the shock was nearer Batavia, Riverview, and Zi-ka-wei, Azimuths 274° , 138° , and 0° ,—which no surface displacement will effect. The focus may be deep, but the only anticentric residual, $-.6s$, for La Paz [P], does not confirm this.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Batavia		14.6 274	i 3 10	-24	5 39?	-43	—	6.3
Manila		22.1 359	e 5 14	+ 8	9 20	+13	10.4	10.5
Adelaide		31.6 152	—	—	11 18	-43	14.3	18.1
Melbourne		37.8 148	12 26	?S	(12 26)	-69	23.1	23.4
Riverview		38.0 138	e 7 22	-16	i 13 12	-26	e 17.4	20.9
Sydney		38.0 138	7 44	+ 6	—	—	23.3	26.1
Zi-ka-wei		38.7 0	7 34	-10	i 13 28	-20	—	—
Colombo		44.0 289	—	—	—	—	—	26.4
Kobe		44.1 19	9 43	?PR ₁	—	—	13.8	—
Osaka		44.2 19	9 1	+34	—	—	—	23.2
Calcutta	N.	44.2 315	8 8	-19	15 14	-9	—	—
	E.	44.2 315	8 14	-13	14 26	-39	—	—
Kodaikanal		47.3 291	14 20	?S	(14 20)	-85	—	—
Mizusawa	E.	50.0 20	9 11	+ 4	16 17	-2	—	—
	N.	50.0 20	9 20	+13	16 16	-3	—	—
Honolulu		84.0 68	i 23 8	?S	(i 23 8)	0	e 44.8	47.3
Helwan		93.9 300	13 20	-17	—	—	—	—
De Bilt	N.	111.9 324	—	—	e 35 35	?SR ₁	e 52.3	63.2
	E.	111.9 324	—	—	e 28 54	+69	44.0	63.6
Victoria		112.1 39	—	—	—	—	—	28.9
Edinburgh		115.1 329	61 20	?L	—	—	(61.3)	—
Bidston		116.1 325	26 20	?S	35 56	?SR ₁	—	61.9
La Paz		154.2 158	19 55	[- 6]	—	—	—	—

Additional records: Batavia $T_0=9h.17m.16s.$, Manila $MN=+10.6m.$, $T_0=9h.17m.46s.$, Melbourne $S=+18m.20s.$, $SR_1=+20m.20s.$, Riverview $PR_1=+9m.2s.$, $SR_1=+15m.56s.$ and $+16m.17s.$, $MN=+20.6m.$, $MZ=+20.2m.$, $T_0=9h.17m.40s.$, Colombo $P=9h.16m.48s.$ and $M=9h.38m.24s.$, in addition to the M given above. Kobe appears to have misprinted 19 days for 9 days. Osaka $MN=+23.5m.$ De Bilt gives $8^{\circ}0S.$, $119^{\circ}6E.$ for epicentre. This seems too far west. Eskdalemuir ($\Delta=115^{\circ}3$) records from 9h.44m. to 10h.40m.

Oct. 9d. Records also at 0h. (San Fernando), 1h. (Taihoku), 2h. (Taihoku and Rocca di Papa), 3h. (Mizusawa), 6h. (Kobe and Osaka), 13h. (Mauritius), 21h. (Tokyo).

Oct. 10d. Records at 0h. (San Fernando), 2h. (Manila), 4h. (Stonyhurst and Colombo), 15h. (San Fernando, Algiers, Tortosa, and Milan), 16h. (Eskdalemuir, Barcelona, Kew, Paris, Algiers, Helwan, and De Bilt), 17h. (Algiers, Ootomari, and Mizusawa), 21h. (Manila), 22h. (Athens).

1918. Oct. 11d. 14h. 14m. 25s. Epicentre 18°·5N. 68°·0W.

(as on 1916 April 24d. 4h.).

 $A = +355, B = -879, C = +317; D = -927, E = -375;$ $G = +119, H = -294, K = -948.$

The above epicentre was adopted from 1916 April 24, but 19°·0N. 68°·0W. was adopted on 1917 July 27d. 1h. and direct comparison of the observations on this latter date with those below shows good accordance. The Bull. Seism. Soc. Amer. for 1922 Dec. assigns an epicentre 15km. W. of the N.W. corner of Porto Rico, or about 18°·5N. 67°·5E.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Vieques	B.O.	2·5	98	0	42	+ 3	—	0·8	—
Port au Prince	B.O.	4·1	271	i 1	25	+21	1 42	-11	2·5
Balboa Hts.	E. B.O.	14·7	231	4	42	+67	—	7·7	8·0
	N. B.O.	14·7	231	4	43	+68	—	7·9	8·1
Cheltenham	E. B.O.	21·7	341	5	4	+ 3	9 13	+14	13·0
	N. B.O.	21·7	341	—	—	—	9 20	+21	11·7
Georgetown	B.O.	21·9	341	i 4	54	-10	9 3	+ 0	10·2
Washington	Mar.	21·9	341	5	2	2	9 4	+1	10·4
Harvard	N. B.O.	24·0	354	5	16	-12	9 42	2	—
	E. B.O.	24·0	354	e 5	46	+18	9 36	- 8	e 10·9
Ithaca	B.O.	25·0	345	5	34	4	10 7	+ 4	13·9
Northfield	B.O.	26·0	352	5	54	+ 6	10 28	+ 6	19·1
Halifax	N. Ma.	26·3	5	5	49	- 2	10 38	+10	20·1
Toronto	M.	26·9	342	6	17	+20	i 10 59	+20	13·6
Ann Arbor	E. B.	27·3	334	5	59	- 2	10 41	- 5	20·2
	N. B.	27·3	334	5	53	- 8	10 35	-11	13·6
	E. W.	27·3	334	5	59	2	10 35	-11	14·3
	N. W.	27·3	334	5	53	- 8	10 35	-11	14·3
Ottawa	N.	27·7	348	5	59	- 6	10 56	+ 2	21·1
	Z.	27·7	348	6	13	+ 8	e 11 35	+41	13·6
St. Louis	N. W.	27·9	321	6	5	- 2	11 5	+ 8	e 14·6
	E. W.	27·9	321	—	—	—	10 59	+ 2	13·4
Tacubaya	W.	29·5	277	5	43	40	—	—	13·1
Lawrence	N. W.	31·2	320	i 7	35	+55	12 49?	+55	15·6
	E. W.	31·2	320	e 7	36	+56	11 53	- 1	17·3?
La Paz	Bi.	35·0	180	i 7	6	- 7	i 12 46	- 9	19·1
La Quiaca	E. M.	40·7	177	18	11	? L.	—	—	19·9
	N. M.	40·7	177	17	53	? L.	—	—	(18·2)
Tucson	N. B.O.	40·8	298	8	1	0	14 22	- 4	(17·9)
	E. B.O.	40·8	298	7	57	- 4	14 27	+ 9	40·9
Saskatoon	Ma.	44·6	328	8	46	+16	15 27	+17	19·8
Andalgala	E. M.	46·1	178	22	23	? L.	—	—	22·6?
	N. M.	46·1	178	21	35	? L.	—	—	(22·4)
Rio de Janeiro	E. B.O.	47·9	150	9	11	+18	18 59	? SR ₁	(21·6)
Lick	N. W.	50·2	303	e 9	15	+ 7	e 16 43	+22	24·7
	Z. W.	50·2	303	e 9	18	+10	e 16 43	+22	—
Pilar	E. M.	50·3	177	10	5	+56	32 11	? L.	30·1
	N. M.	50·3	177	9	23	+14	33 11	? L.	31·7
Berkeley	E. —	50·8	304	e 9	18	+ 6	e 16 44	+15	(32·2)
	N. —	50·8	304	e 9	37	+25	e 16 43	+14	(33·2)
Victoria	M.	53·5	317	9	13	-17	16 36	-27	34·6
	Z. W.	53·5	317	9	35	+ 5	17 17	+14	36·4
Chacarita	M.	53·8	170	9	23	- 9	(17 5)	- 1	(33·4)
Coimbra	N. —	55·2	53	9	43	+ 3	17 1	-23	35·4
	E. —	55·2	53	—	—	—	17 3	-21	22·9
San Fernando	—	56·7	58	9	59	+ 9	17 47	+ 5	24·3
Cork	—	56·9	40	10	35	+44	18 5	+20	26·1
Cipolletti	M.	57·4	180	9	47	- 8	18 41	+50	26·1
Granada	C.	58·8	56	i 11	12	+68	i 19 23	+74	30·8
Ascension	M.	59·1	111	9	35	-31	—	—	—
Bidston	M.S.	60·4	38	11	2?	+47	18 54	+26	—
Eskdalemuir	G.	60·6	36	10	26	+10	18 32	+ 1	27·3
Edinburgh	M.	60·7	36	—	—	—	—	—	—
Stonyhurst	M.	60·8	38	(i 9 59)	—	-19	(i 18 5)	-28	39·6
								i 18·1	30·8

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O—C.	S.	O—C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
Shide	M.B.	61.1	42	10 41	+21	18 46	+9	—	—
	M.S.	61.1	42	10 32	+12	18 43	+6	28.7	30.4
Oxford	M.S.	61.2	40	10 43	+23	19 9	+31	—	—
Dyce	N. Ma.	61.5	34	i 10 51	+29	18 57	+15	22.4	34.2
	E. Ma.	61.5	34	i 10 39	+17	18 57	+15	—	—
Kew	M.	61.8	41	9 35	—49	—	—	—	39.6
Tortosa	—	62.0	51	10 33	+8	18 55	+7	26.0	36.6
Sitka	E. B.O.	62.3	326	10 49	+22	—	—	e 34.6	40.7
	N. B.O.	62.3	326	—	—	e 19 15	+23	e 33.1	35.9
Barcelona	—	63.2	52	10 47	+14	19 8	+5	—	34.0
Paris	—	63.5	43	e 10 45	+10	19 21	+14	26.6	26.6
Algiers	B.M.	64.1	59	10 44	+5	19 22	+8	27.1	32.6
Uccle	—	64.7	41	e 10 45	+2	19 30	+9	26.9	29.0
De Bilt	—	65.2	40	10 54	+8	19 39	+12	27.0	29.8
	—	65.2	40	10 56	+10	i 19 49	+22	28.4	28.6
Besançon	—	65.8	46	10 56	+6	19 56	+21	30.6	—
Moncalieri	S.	67.0	48	11 2	+4	19 53	+3	27.4	41.3
Zurich	—	67.5	45	e 11 8	+7	20 22	+26	—	—
Milan	Ag.	68.1	44	11 32	+27	—	—	—	21.3
Rocca di Papa	Ag.	71.0	51	11 31	+8	20 50	+12	e 28.9	38.5
Pola	W.	71.4	46	e 11 50	+24	e 20 56	+13	e 32.7	39.2
Monte Cassino	Ag.	71.9	52	11 37	+8	—	—	—	11.9
Pompeii	O.A.	72.5	52	i 11 9	—24	i 20 35	—21	30.6	37.6
Zagreb	W.	72.7	47	e 11 40	+6	i 21 2	+4	42.6	45.6
Budapest	—	74.5	43	12 1	+15	—	—	—	—
Lemberg	B.O.	77.3	41	i 12 28	+25	i 22 13	+21	e 36.3	41.6
Athens	—	80.1	53	e 12 19	—1	22 23	—1	e 38.1	43.0
Honolulu	M.	83.4	290	12 59	+21	23 17	+16	40.6	54.9
Helwan	M.	88.6	59	12 59	—9	—	—	—	59.8
Cape Town	M.	97.4	125	—	—	24 53	—37	43.9	46.9
Apia	W.	107.1	259	e 13 59?	? PR ₁	e 28 29?	?	44.6	49.6
Ootomari	O.	109.1	333	e 19 12	? PR ₁	—	—	—	—
Simla	O.E.	120.2	30	e 20 17	? PR ₁	e 37 5	? SR ₁	53.5	56.8
Kobe	O.	122.4	337	—	—	26 23	—164	60.1	73.1
Osaka	O.	122.4	337	19 28	[+29]	36 18	? SR ₁	54.2	69.5
Bombay	O.E.	126.3	42	19 29	[+20]	—	—	—	65.4
Mauritius	N. M.	129.2	98	34 41	?	54 35	?	66.8	70.5
	E. M.	129.2	98	21 53	? PR ₁	53 5	?	62.6	64.3
Zi-ka-wei	—	129.5	350	e 19 23	[+6]	—	—	—	74.3
Calcutta	N. O.E.	132.9	31	22 23	? PR ₁	23 11	?	—	—
Kodaikanal	M.	135.4	48	23 35	? PR ₁	—	—	82.3	88.4
Taihoku	O.	135.5	346	e 22 17	? PR ₁	—	—	—	—
Colombo	M.	139.3	50	23 5	? PR ₁	32 59	+119	62.1	100.1
Riverview	—	141.9	238	e 19 35	[+8]	e 33 46	+152	e 60.5	64.9
Melbourne	M.	145.4	230	20 29	[+40]	—	—	—	87.6
Manila	W.	145.8	344	e 19 57	+7	34 27	?	68.7	79.9
Adelaide	M.	151.3	230	20 41	[+43]	34 1	?	—	85.4
Batavia	W.	166.7	23	20 33	[+20]	—	—	e 61.6	77.6

Additional records: Washington gives M = +9.9m. Georgetown iSN = +9m.9s., MN = +15.9m., T₀ = 14h.14m.24s. Harvard PSE = +8m.15s., T₀ = 14h.14m.11s. Ithaca iN = +6m.26s., MN = +19.2m., T₀ = 14h.14m.16s. Northfield MN = +18.6m., T₀ = 14h.14m.35s. Halifax T₀ = 14h.14m.10s. Toronto iP = +6m.47s., L = +11.8m., T₀ = 14h.14m.46s. Ottawa T₀ = 14h.14m.10s. La Paz i = +13m.54s. and +17m.12s., T₀ = 14h.14m.22s. La Quiaca PE = +27m.35s., PN = +27m.11s., SE = +40m.59s., SN = +40m.5s. These seem to belong to a different shock. Saskatoon SR₁ = +18m.45s., T₀ = 14h.14m.44s. Andalgala PE = +32m.23s., PN = +32m.41s., SE = +42m.5s., SN = +43m.47s., and several other Ms. Rio de Janeiro LN = +25.4m., MN = +27.4m., T₀ = 14h.13m.36s., T₀E = 14h.13m.0s. Lick T₀ = 14h.14m.18s. Berkeley T₀ = 14h.14m.23s. Chacarita gives S as another P and L as S. Tucson PR₁E = +9m.58s., SR₁N = +17m.24s., T₀ = 14h.14m.16s. Coimbra PR₁N = +12m.23s., iN = +17m.45s., iE = +17m.51s., T₀ = 14h.14m.56s. San Fernando MN = +33.8m. Eskdalemuir PR₁ = +13m.16s., PR₂ = +14m.7s., T₀ = 14h.14m.48s. Edinburgh P = 14h.10m.0s. Stonyhurst M = +35.6m. The true P is given as S and eP = +47s. is recorded. Barcelona PS? = +9m.25s., SR₂? = +26m.52s., MN = +28.7m., M₂ = +38.9m.,

Notes continued on next page.

$T_0 = 14\text{h.}14\text{m.}53\text{s.}$ Paris $PR_1 = +14\text{m.}55\text{s.}$, $SR_1 = +23\text{m.}32\text{s.}$, $T_0 = 14\text{h.}14\text{m.}35\text{s.}$
 Algiers LM = +30.6m., $T_0 = 14\text{h.}14\text{m.}32\text{s.}$ Uccle $i = +11\text{m.}4\text{s.}$, $SR_1 = +23\text{m.}38\text{s.}$, $T_0 = 14\text{h.}14\text{m.}26\text{s.}$ De Bilt $eSR_1E = +23\text{m.}53\text{s.}$, $T_0 = 14\text{h.}14\text{m.}35\text{s.}$ Marseilles ($\Delta = 65.5$) gives records at 14h. and 15h.
 Moncalieri MN = +39.8m., $T_0 = 14\text{h.}14\text{m.}37\text{s.}$ Pola MN = +33.7m., $T_0 = 14\text{h.}15\text{m.}9\text{s.}$ Zagreb $iP = +11\text{m.}46\text{s.}$, $iPR_2NW = +16\text{m.}58\text{s.}$, $iPR_2NE = +17\text{m.}7\text{s.}$, $iNW = +21\text{m.}10\text{s.}$, $iNE = +21\text{m.}15\text{s.}$, $SR_1NW = +26\text{m.}24\text{s.}$
 Athens MN = +43.3m., $T_0 = 14\text{h.}14\text{m.}38\text{s.}$ Cape Town P = 14h.4m.0s.
 Apia $e_2? = +25\text{m.}29\text{s.}$, $e_1 = +34\text{m.}35\text{s.}$ Kobe MN = -74.4m. Osaka MN = +74.3m. Zi-ka-wei MN = +74.4m. Riverview $ePR_1 = +23\text{m.}0\text{s.}$ and +23m.46s., $PS? = +34\text{m.}40\text{s.}$, $eSR_3? = +42\text{m.}22\text{s.}$, MN = +60.8m., MZ = +82.6m. Manila MN = +83.0m. Adelaide $PR_1 = +24\text{m.}11\text{s.}$ M is given at 14h. instead of 15h. Batavia records an M at 14h.47m.0s.

1918. Oct. 11d. 17h. 3m. 34s. Epicentre $18^\circ 5'N. 68^\circ 0'W.$

(as at 14h.).

A = +.355, B = -.879, C = +.317; D = -.927, E = -.375;
 G = +.119, H = -.294, K = -.948.

The interval from 14h.14m.25s. is 169m.9s., which is close to $8 \times 21\text{m.}$, but does not seem to be related to Dr. Jeans's periods of 125.8m. and 222.0m.

Station and Component.	Machine.	Δ	Azimuth.	P.			O-C.			S.			O-C.			L.			M.		
				M.	S.	S.	M.	S.	S.	M.	S.	S.	M.	S.	S.	M.	S.	S.	M.	S.	S.
Vieques	N.	B.O.	2.5	98	0	44	+ 5									1.0			1.6		
	E.	B.O.	2.5	98	0	42	+ 3									0.9			3.1		
Port au Prince		B.O.	4.1	271	11	36	+32									2.8			2.9		
Balboa Heights		B.O.	14.7	231						5	26	-59				e 10.4					
Cheltenham	N.	B.O.	21.7	341	15	6	+ 5			9	10	+11				12.8			15.1		
Georgetown	E.		21.9	341	5	7	+ 3			19	9	+ 6				e 10.4					
	N.		21.9	341	5	5	+ 1			9	17	+14				e 10.4					
	Z.		21.9	341	5	9	+ 5			9	0	- 3				e 10.2					
Washington		Mar.	21.9	341	5	7	+ 3			9	8	+ 5				10.5					
Harvard	N.	B.O.	24.0	354	5	15	-13			(e 9 34)		-10				e 9.6			12.6		
	E.	B.O.	24.0	354	5	15	+47			e 10	5	+21				e 11.2					
Ithaca	N.	B.O.	25.0	345	5	34	- 4			10	5	+ 2				12.0					
Northfield		B.O.	26.0	352	10	26	?S			(10 26)		4				e 12.4					
Halifax	N.		26.3	5	15	51	0			e 10 4)		12				e 13.4					
Toronto		M.	26.9	342												13.9			21.5		
Ann Arbor	E.	W.	27.3	334	5	56	- 5									13.4			20.4		
	N.	W.	27.3	334	5	56	- 5									14.4			19.4		
Ottawa			27.7	348	e 6	0	- 5			110	41	-13				e 12.4					
St. Louis	N.	W.	27.9	321	16	2	5			12	26	?L				17.0					
La Paz	Bi.		35.0	180	7	31	+18									18.7			22.7		
Saskatoon	Ma.		44.6	328	18	48	+18									e 25.4					
Andalgala	M.		46.1	178															44.7		
Tortosa			62.0	51	10	23	- 2			18	55	+ 7							29.4		
Barcelona			63.2	52												e 25.6			30.6		
Algiers	B.M.		64.1	59												e 30.4			33.4		
Uccle			64.7	41	e 10	44	1			e 19	26	+ 5							29.4		
De Bilt	N.		65.2	40												28.4			29.5		
	E.		65.2	40												31.4			32.6		
Hohenheim		B.O.	67.9	44	11	8	+ 5														
Rocca di Papa	Ag.		71.0	51	11	29	+ 6												11.8		
Graz	W.		72.2	45	e 11	32	+ 1														
Zagreb	W.		72.7	47	11	39	- 5			21	3	+ 5				40.4					
Manila	W.		145.8	344	e 20	26	[+36]														

Additional records: Cheltenham gives SE = +9m.7s., T = 7h.3m.38s.
 Georgetown LE = +14.9m., LN = +13.5m., LZ = +12.7m., $T_0 = 17\text{h.}3\text{m.}34\text{s.}$
 Harvard SE = +8m.37s. and +8m.51s., $T_0 = 17\text{h.}4\text{m.}48\text{s.}$ Halifax eLE
 +11.9m. Toronto eL = +16.5m. Ann Arbor gives the records in the
 table from its Wiechert; it also gives from the Bosch. PE = +6m.2s.,
 PN = +5m.50s., M = +19.4m. Ottawa eE = +4m.41s. La Paz M =
 +25.4m. Saskatoon $i = +20\text{m.}57\text{s.}$ Andalgala MN = +45.4m.
 Zagreb SNE = +21m.19s.

Oct. 11d. Records also at 0h. (Athens), 7h. (Pa Paz), 8h. (Algiers), 11h. (Sydney), 12h. (La Paz), 14h. (Port au Prince (3)), 15h. (Port au Prince (3) and Vieques), 16h. (Vieques, Port au Prince, and Mobile), 17h. (Port au Prince (2) and Vieques (2)), 18h. (Mobile, Port au Prince (2), Rocca di Papa, and Vieques), 19h. (Port au Prince (3) and Vieques), 20h. (Port au Prince, Vieques, Edinburgh, De Bilt, and Washington), 21h. (Helwan and Vieques), 22h. (Port au Prince), 23h. (Vieques (3), Helwan, and Port au Prince).

Oct. 12d. 0h. 15m. 30s. Epicentre $18^{\circ}5'N$, $68^{\circ}0'W$. (as on 1918 Oct. 11d.).

$$A = +.355, B = -.879, C = -.317; \quad D = -.927, E = -.375; \\ G = +.119, H = -.294, K = -.948.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Vieques	2.5	98	0 40	+ 1	—	—	1.1	1.4
Port au Prince	4.1	271	e 1 41	? 8	(e 1 41)	-12	(2.1)	3.3
Georgetown	21.9	341	e 5 12	+ 8	9 57?	+54	20.3	—
Washington	21.9	341	5 20	+16	9 22	+19	15.0	—
Harvard	21.0	354	5 29	+ 1	10 42	?SR ₁	14.7?	16.7
Ottawa	27.7	348	—	—	e 9 30?	?	e 21.5	—
Edinburgh	60.7	36	4 30	?	—	—	—	40.5
De Bilt	N. 65.2	40	—	—	—	—	28.5	29.5

Additional records: Georgetown gives ePN = +5m.18s. Harvard T₀ = 0h.14m.23s. Ottawa e = +14m.6s. De Bilt eLE = +32.5m.

Oct. 12d. 8h. 19m. 37s. Epicentre $18^{\circ}5'N$, $68^{\circ}0'W$. (as on October 11d. 14h. and 17h. and Oct. 12d. 0h.).

$$A = +.355, B = -.879, C = +.317; \quad D = -.927, E = -.375; \\ G = +.119, H = -.294, K = -.948.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Vieques	N.	2.5	98	0 2	-37	—	—	0.4	0.3
Port au Prince		4.1	271	e 1 58	+54	2 27	+34	3.0	3.3
Cheltenham		21.7	341	i 5 6	+ 5	—	—	14.7	15.2
Georgetown	E.	21.9	341	5 7	+ 3	9 15	+12	14.8	—
	N.	21.9	341	5 2	- 2	9 4	+ 1	14.8	—
Washington		21.9	341	5 3	- 1	9 3	0	14.6	—
Harvard	E.	24.0	354	e 5 40	+12	10 2	+18	e 11.4	—
	N.	21.0	354	i 5 16	-12	9 32	-12	12.6	—
Ithaca	N.	25.0	345	e 5 26	-12	e 10 8	+ 5	12.7	—
Ottawa		27.7	348	e 10 23?	?	e 12 29	+95	e 15.2	—
La Paz		35.0	180	7 38	+25	—	—	21.4	24.2
Edinburgh		60.7	36	3 23	?	—	—	—	41.4
Stonyhurst		60.8	38	—	—	—	—	—	33.4
Kew		61.8	41	—	-	—	—	—	44.4
De Bilt	E.	65.2	40	—	—	—	—	30.4	31.8
	N.	65.2	40	—	—	—	—	e 28.4	29.0
Rocca di Papa		71.0	51	e 10 54	-29	—	—	—	12.0
		71.0	51	e 11 16	- 7	—	—	—	36.3

Additional records: Vieques gives PE = -0m.3s., LE = +0.2m., ME = +1.0m. Harvard LN = +15.9m., T₀ = 8h.19m.31s. Eskdalemuir gives 8h.37m. to 9h.20m.

Oct. 12d. Records also at 0h. (Washington (2), Vieques (3), Port au Prince (3), and San Fernando), 1h. (Port au Prince, Georgetown, Harvard, and Vieques), 2h. (San Fernando), 4h. (Vieques (2) and Port au Prince), 5h. (Port au Prince), 6h. (Vieques), 7h. (Zi-ka-wei and Port au Prince), 8h. (Port au Prince (2) and Vieques), 13h. (Eskdalemuir, Rocca di Papa, Kew, Bidston, Zagreb, Paris, De Bilt, and Ootomari), 21h. (San Fernando).

Oct. 13d. 4h. 51m. 30s. Epicentre $18^{\circ}5'N$. $68^{\circ}0'W$. (as at 0h. and 8h., &c.).

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Vieques	E.	2.5	98	e 0 41	- 2	—	—	0.7	1.5
	N.	2.5	98	e 0 49	+10	—	—	1.2	2.8
Port au Prince	N.F.	4.1	271	e 1 10	+ 6	1 45	- 8	2.1	2.4
	N.W.	4.1	271	e 1 17	-13	1 50	- 3	2.1	2.3
Cheltenham		21.7	341	5 30	+29	—	—	15.1	15.8
Georgetown		21.9	341	e 5 4	0	9 7?	+ 4	e 11.1?	—
Washington		21.9	341	5 2	- 2	9 4	- 1	14.5	—
La Paz		35.0	180	7 5	- 8	—	—	—	—
De Bilt	E.	65.2	40	—	—	—	—	e 31.5	41.9
	N.	65.2	40	—	—	—	—	e 29.5	37.8

Additional records : Georgetown gives LE = +15.0m., LN = +15.1m.

Oct. 13d. 12h. 39m. 20s. Epicentre $19^{\circ}0'S$. $177^{\circ}0'W$. ? ? (as on 1918 June 4d. 17h.), but very doubtful. Possibly it is from the epicentre of 14d. 12h., but there is not good accordance.

A = -.944, B = -.049, C = -.326 ; D = -.052, E = +.999 ;
G = +.325, H = +.017, K = -.946.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Apia		7.3	45	e 1 52	+ 1	—	—	3.6	4.7
Riverview		31.9	236	e 6 43	- 3	e 10 33	-94	e 12.6	16.9
Melbourne		38.5	232	—	—	—	—	17.7	20.7
Honolulu		44.4	26	18 28	?SR ₁	21 34	?	22.7	27.7
Perth, W.A.		60.7	243	30 44	?L	—	—	(30.7)	—
Manila		69.7	294	e 12 40	+85	—	—	—	—
Batavia		74.9	269	e 10 40	-68	—	—	—	—
Victoria		82.7	33	—	—	—	—	—	46.6
Toronto		108.4	49	—	—	—	—	73.1	—
Edinburgh		143.0	6	80 40	?L	—	—	(80.7)	—
De Bilt	N.	146.9	358	—	—	e 34 22	?	e 77.7	84.0
	E.	146.9	358	—	—	e 62 22	?	e 76.7	85.2
Helwan		152.1	298	42 40	?SR ₁	—	—	—	—

Additional records : Riverview MN = +15.4m., T₀ 12h. 41m. 15s. If we accept this T₀ there must have been a separate shock near Apia. Port au Prince ($\Delta = 109^{\circ}4$), eP = +6m.50s., M = +7.4m., which probably refers to another shock close to Port au Prince.

Oct. 13d. Records also at 1h. (De Bilt and Helwan), 2h. (De Bilt, Lick, Berkeley, Port au Prince, and Victoria), 3h. (De Bilt, Toronto, and Eskdalemuir), 5h. (Toronto, La Paz, Port au Prince, and Helwan), 6h. (San Fernando), 14h. (La Paz and Manila), 15h. (La Paz), 17h. (Port au Prince and Edinburgh), 18h. (La Paz and Vieques), 20h. (Vieques and Port au Prince), 22h. (Georgetown and Harvard).

Oct. 14d. 0h. 24m. 20s. Epicentre $18^{\circ}5'N$. $68^{\circ}0'W$. (as on Oct. 11d. and 12d.).

A = +.355, B = -.879, C = +.317 ; D = -.927, E = -.375 ;
G = +.119, H = -.294, K = -.948.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Vieques	N.	2.5	98	0 58	?S	(0 58)	-11	1.4	1.8
Port au Prince		4.1	271	e 1 25	+21	1 51	- 2	2.5	2.7
Balboa Heights		14.7	231	5 40	?S	(5 40)	-45	—	—
Cheltenham	N.	21.7	341	e 6 6	+65	—	—	e 15.2	16.0
Washington		21.9	341	5 11	+ 7	9 15	+12	14.5	—
Georgetown	N.	21.9	341	i 5 13	+ 9	e 9 22	+19	e 10.4	—
	E.	21.9	341	i 5 15	+11	i 9 20	+17	14.7	—
Harvard	N.	24.0	354	e 5 23	- 5	9 34	-10	e 11.5	16.5
	E.	24.0	354	e 5 36	+ 8	8 59	-45	e 12.6	16.4
Ithaca	N.	25.0	345	5 45	+ 7	10 11	+ 8	e 12.9	—
Toronto		26.9	342	—	—	(10 10)	-29	e 15.9	17.0
Ottawa		27.7	348	5 40	-25	—	—	e 11.7	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz		35.0	180	7 14	+ 1	13 1	+ 6	21.0	22.0
Victoria		53.5	317	—	—	—	—	—	38.1
Rio Tinto		56.4	56	31 40	?L	—	—	(31.7)	38.7
San Fernando		56.7	58	29 40	?L	—	—	(29.7)	—
Edinburgh		60.7	36	18 40	?S	(18 40)	+ 8	—	37.7
Stonyhurst		60.8	38	e 19 10	?S	(19 10)	+37	—	33.9
Shide		61.1	42	30 38	?L	—	—	(30.6)	—
Kew		61.8	41	—	—	—	—	—	46.7
De Bilt	E.	65.2	40	—	—	e 20 7	+40	e 30.7	34.5
	N.	65.2	40	—	—	—	—	e 27.7	29.4
Graz		72.2	45	e 11 38	+ 7	—	—	—	—
Helwan		88.6	59	25 40	?S	(25 40)	+101	—	—
Ootomari		109.1	333	e 67 31	?L	—	—	(e 67.5)	—

Additional records: Vieques ME = +1.7m. Cheltenham gives PE = +6m.7s. Georgetown LN = +15.0m., T₀ = 0h.24m.24s. Harvard T₀ = 0h.25m.14s. Toronto records S as an L. Eskdalemuir (Δ = 60° 6) 0h.41m. to 1h.21m. Stonyhurst M = 36.7m. Paris (Δ = 63° 5) gives a record at 1h. Graz gives its record as 23 or 0h.

Oct. 14d. 2h. 15m. 20s. Epicentre 18°5N. 68°0W. (as at 0h.).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Vieques	N.	2.5	98	1 0	?S	(1 0)	- 9	1.5	2.7
	E.	2.5	98	1 2	?S	(1 2)	- 7	1.4	1.7
Port au Prince		4.1	271	1 47	+43	2 8	+15	2.6	2.8
Georgetown		21.9	341	—	—	—	—	15.1	—
Washington		21.9	341	5 10	+ 6	9 15	+12	14.7	—
Harvard		24.0	354	—	—	—	—	15.3	—
La Paz		35.0	180	7 40	+27	—	—	(18.6)	—
Edinburgh		60.7	36	34 40	?L	—	—	(34.7)	—
De Bilt		65.2	40	—	—	—	—	e 34.7	—

Washington T₀ = 2h.15m.23s.
shock.

The La Paz L is given as the P of a second

1918. Oct. 14d. 12h. 0m. 20s. Epicentre 19° 5S. 174° 2W.

A = -'938, B = -'095, C = -'334 ; D = -'101, E = +'995 ;

G = +'332, H = +'034, K = -'943.

The Australian residuals suggest an epicentre nearer Australia, but this would not suit the Apia observation, unless we assume a deep focus, for which the anticentric residuals give some evidence.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
Apia	W.	6.1	23	1 35	+ 2	—	—	2.9	—
Riverview	—	33.9	238	e 6 30	-34	e 11 37	-62	e 14.3	17.6
Sydney	M.	33.9	238	7 34	+30	11 58	-41	17.5	19.9
Melbourne	M.	39.8	233	7 46	- 7	13 40	-23	22.9	24.1
Honolulu	M.	43.8	21	14 58	?S	(14 58)	- 1	21.7	26.2
Adelaide	M.	44.3	239	6 51	-97	14 21	-45	21.5?	27.2
Mizusawa	E.	72.0	325	11 19	-11	20 46	- 4	—	—
	N.	72.0	325	11 20	-10	20 43	- 7	—	—
Manila	W.	72.3	292	e 11 34	+ 2	(20 51)	- 3	20.8	21.8
Osaka	O.	72.3	319	11 36	+ 4	20 59	+ 5	30.7	43.1
Berkeley	—	75.3	40	e 11 38	-13	—	—	—	—
Taihoku	O.	76.8	304	—	—	e 21 44	- 3	—	—
Batavia	W.	77.5	270	e 11 40	-24	(21 40)	-15	39.7	42.7
Tucson	B.O.	79.7	50	—	—	—	—	e 36.9	40.7
Zi-ka-wei	—	79.9	310	e 12 28	+10	e 21 42	-40	—	—
Victoria	M.	81.7	31	33 33	?	—	—	38.6	43.9
Cipolletti	M.	89.6	134	23 34	?S	(23 34)	-36	(45.7)	47.0
Andalgala	M.	95.8	124	38 16	?	—	—	—	69.8
La Paz	Bi.	98.9	111	13 48	-17	25 3?	-42	45.4	47.8

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Toronto	M.	106.7	48		—	27 58?	+60	54.1	60.6
Colombo	M.	107.3	270	33 40	?SR ₁	—	—	—	75.7
Ithaca	N. E.	B.O. 108.6	50	16 2	+71	e 27 39	+24	—	—
		B.O. 108.6	50	e 18 47	?PR ₁	e 28 18	+63	e 54.7	—
Ottawa	—	109.6	48	19 40?	?PR ₁	e 27 40?	+16	e 27.7?	—
Harvard	N. E.	B.O. 112.5	51	—	—	e 25 22	-148	50.4	—
		B.O. 112.5	51	e 15 39	+30	26 51	-59	54.0	61.7?
Mauritius	E.	M.	115.4	238	—	—	—	56.8	—
Edinburgh	M.	143.0	9	20 40	[+55]	—	—	—	92.2
Eskdalemuir	G.	143.6	9	i 17 56	+31	i 21 27	?PR ₁	67.7	—
Stonyhurst	M.	145.1	10	—	—	e 61 40	?	i 78.5	88.7
Bidston	M.S.	145.4	10	36 52	?	44 40	?SR ₁	—	75.2
De Bilt	—	147.4	0	19 38	[-14]	42 15	?	e 73.7	72.4
Kew	M.	147.7	10	—	—	—	—	—	89.7
Shide	M.S.	148.3	10	—	—	—	—	77.9	85.4
Uccle	—	148.7	0	e 19 33	[-21]	—	—	—	81.7
Hohenheim	—	150.6	355	19 55?	[-2]	—	—	—	—
Paris	—	150.6	4	e 19 42	[-15]	—	—	81.7	—
Zagreb	W.	152.4	345	19 43	[-16]	—	—	77.7	83.7
Moncalieri	S.	154.5	357	e 36 40	?	—	—	73.8	—
Helwan	M.	154.7	300	19 58	[-4]	—	—	—	123.2
Rocca di Papa	Ag.	157.0	347	19 46	[-19]	—	—	77.6	88.1
San Fernando	—	160.1	29	19 40	[-28]	39 10	?	—	90.7
Algiers	B.M.	162.6	7	—	—	—	—	e 82.7	88.7

Additional records: Riverview gives $ePR_1 = +7m.42s.$ and $+7m.54s.$, $iPS = +11m.52s.$ and $+12m.10s.$, $MN = +15.7m.$, $MZ = +18.6m.$, $T_0 = 12h.0m.23s.$
Honolulu $S = +18m.52s.$ (?SR₁). Adelaide $PR_1 = +10m.26s.$, $SR_1 = +18m.1s.$
Andalgala $PE = +59m.28s.$, $SE = +62m.28s.$, $SN = +63m.46s.$
Manila $S = +17m.2s.$, $MN = +22.4m.$ Batavia says $M = +21m.40s.$; possibly a misprint for S. Cipolletti gives $P = +42m.22s.$, $S = +45m.40s.$; perhaps Ls. Toronto $eL = +56.1m.$ Harvard $SN = +28m.12s.$,
 $eE = +40m.51s.$, $eN = +42m.4s.$, $LE = +55.7m.$, $T_0 = 12h.2m.41s.$ and $12h.2m.48s.$
Eskdalemuir $i = +53m.11s.$ De Bilt $eLN = +70.7m.$,
Epicerentre $22^\circ.3S.$ $177^\circ.2W.$ Zagreb $iPNW = +19m.50s.$, $iPNE = +20m.3s.$,
 $MNW = +87.7m.$

Oct. 14d. 14h. 6m. 5s. Epicentre $33^\circ.0N.$ $22^\circ.0E.$

$A = +.778$, $B = +.314$, $C = +.545$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	11.4	323	e 2 31	-19	9 43?	?	—	—
Pola	13.4	334	e 8 24	?	—	—	e 9.3	9.5
Zagreb	13.6	342	e 3 25	+4	—	—	i 7.6	8.2
Budapest	14.6	352	6 25	?S	(6 25)	+3	—	—
Moncalieri	16.3	322	3 53	-3	8 15	?L	11.3	13.2
Hohenheim	18.8	333	e 4 26	-1	7 56	-2	—	—
Uccle	22.0	329	—	—	—	—	e 12.9	—
De Bilt	22.6	332	—	—	e 9 25	+8	e 12.8	15.3

Additional records: Rocca di Papa gives also $P = +3m.37s.$ Pola $MN = +9.4m.$
Budapest $P = +14m.1s.$ Graz ($\Delta = 14^\circ.9$) gives $eP = 14h.4m.$,
 $eS = 14h.8m.$, no seconds being given in either case.

Oct. 14d. Records also at 1h. (Mizusawa), 4h. (Vieques and Port au Prince (2)), 6h. (Mizusawa), 10h. (Manila), 19h. (Batavia).

Oct. 15d. 23h. 29m. 40s. Epicentre $46^\circ.0N.$ $130^\circ.0W.$ (as on 1918 April 17d. 2h.).

$A = -.447$, $B = -.532$, $C = +.719$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria	5.2	59	1 39	+19	—	—	3.2	4.1
Berkeley	9.9	133	—	—	e 3 53	-31	—	—
Toronto	35.3	75	—	—	—	—	19.3	21.2
Ottawa	37.1	71	—	—	—	—	e 18.3	—

Ottawa gives also $eN = +20m.32s.$, $eL = +22.3m.$

Oct. 15d. Records also at 0h. (Port au Prince (2) and Vieques), 1h. (Mizusawa and Batavia), 2h. (San Fernando), 3h. (Vieques, Mizusawa, Osaka, Kobe, Tokyo, La Paz, and Port au Prince), 4h. (Mizusawa (2) and Tokyo (2)), 7h. (De Bilt), 10h. (Riverview and Sydney), 13h. (Mizusawa, Tokyo, and De Bilt), 18h. (De Bilt, Helwan, Eskdalemuir, Athens, and Algiers), 19h. (Mizusawa), 22h. (De Bilt, Eskdalemuir, Edinburgh, and Zurich (2)).

Oct. 16d. 20h. 4m. 35s. Epicentre $8^{\circ}5'S$. $125^{\circ}5'E$.

$A = -.574$, $B = +.805$, $C = -.148$; $D = +.814$, $E = +.581$;

$G = +.086$, $H = -.120$, $K = -.989$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Manila	23.5	349	e 5 30	+ 7	—	—	6.1	6.2
Perth, W.A.	25.1	200	(5 28)	-11	9 42	-23	15.5	—
Adelaide	29.0	157	6 26	+ 8	11 6	-11	14.6	18.8
Melbourne	34.1	152	(7 7)	+ 1	12 25	-17	21.2	22.0
Riverview	34.6	141	e 7 12	+ 2	112 46	- 3 e	14.6	20.2
Zi-ka-wei	39.9	358	7 33	-21	—	—	—	—
Kobe	44.1	10	8 31	+ 4	—	—	e 19.3	19.5
Osaka	44.2	10	8 29	+ 2	—	—	—	19.6
Colombo	48.1	287	14 25	?	—	—	—	31.4
Mizusawa	E. 49.8	14	9 10	+ 4	16 11	- 5	—	—
	N. 49.8	14	9 14	+ 8	16 10	- 6	—	—
Kodaikanal	51.3	291	21 19	?L	—	—	(21.3)	—
Bombay	58.7	300	10 8	+ 5	—	—	—	—
Mauritius	E. 66.1	252	20 49	?S	(20 49)	+71	33.0	35.4
Honolulu	80.7	65	—	—	e 22 55	+24	41.4	49.2
Helwan	97.8	300	21 25	?	—	—	—	—
Zagreb	109.7	316	e 19 1	?PR ₁	26 19?	-66	35.4	—
De Bilt	N. 115.1	324	—	—	e 28 33	+22 e	59.4	61.2
	E. 115.1	324	—	—	e 29 37	+86 e	56.4	61.4
Moncalieri	115.5	318	e 20 39	?PR ₁	—	—	29.5	—
Ucele	116.0	322	e 19 49	?PR ₁	e 30 25	+127	—	—
Edinburgh	118.0	330	19 25	?PR ₁	—	—	—	—
Eskdalemuir	118.3	330	20 8	?PR ₁	31 6	+150	54.4	—
Kew	118.4	326	—	—	—	—	—	31.4
Stonyhurst	118.6	328	20 25	?PR ₁	—	—	—	70.6
Bidston	119.1	328	20 1	?PR ₁	30 55	+132	—	49.2
Shide	119.3	325	20 29	?PR ₁	—	—	—	—
La Paz	151.6	152	20 16	[+18]	32 58?	?	85.4	88.9

Additional records: Perth records P as PR₁. Melbourne gives also SR₁ = +16m.13s., SR₂ = +17m.7s.; P is recorded as PR₁. Riverview PR₁ = +8m.41s., 1S = +12m.51s., PS = +13m.0s., MZ = +19.7m., MN = +20.7m., T₀ = 20h.4m.46s. Kobe MN = +20.1m. Osaka MN = +19.4m. Colombo M = +20.9m. De Bilt ePR₁E = +19m.58s., m = +30m.47s.

Oct. 16d. Records also at 0h. (Edinburgh, Eskdalemuir, and De Bilt), 1h. (La Paz and San Fernando), 5h. (San Fernando), 8h. (Helwan, Tokyo, and Colombo), 10h. (Helwan, Zagreb, and Athens), 19h. (Port au Prince, Batavia, and Vieques).

Oct. 17d. 8h. 19m. 3s. Epicentre $18^{\circ}5'N$. $68^{\circ}0'W$. (as on 1918 Oct. 14d. 2h. and previously).

$A = +.355$, $B = -.879$, $C = +.317$.

	Δ	Az.	P.	O-C.	L.	M.
			m. s.	s.	m.	m.
Vieques	N. 2.5	98	0 37	- 2	1.0	1.7
	E. 2.5	98	0 36	- 3	0.9	1.2
Port au Prince	4.1	271	e 1 4	0	—	2.5
La Paz	35.0	180	7 42	+29	—	—
De Bilt	E. 65.2	40	—	—	e 33.8	—

De Bilt gives eLN = +28.4m.

Oct. 17d. Records also at 1h. (San Fernando), 9h. (Mizusawa and Tokyo), 12h. (Mizusawa (2)), 16h. (De Bilt), 18h. (Mizusawa), 19h. (San Fernando), 21h. (Vieques).

1918. Oct. 18d. 21h. 33m. 35s. Epicentre 18°·5N. 68°·0W.

(as on 1918 Oct. 17d. 8h. and previously).

A = +·355, B = -·879, C = +·317; D = -·927, E = -·375;
G = +·119, H = -·291, K = -·948.

Station and Component.		Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
					M. S.	S.	M. S.	S.	M.	M.
Vieques	N.	B.O.	2·5	98	0 42	+ 3			1·0	2·3
	E.	B.O.	2·5	98	0 38	- 1			1·1	1·4
Port au Prince		B.O.	4·1	271	e 1 39	- 35	2 7	+14	2·5	2·9
Cheltenham	N.	B.O.	21·7	341	5 6	+ 5	9 5	+ 6	12·6	15·9
Georgetown	E.		21·9	341	e 5 9	- 5	9 23	+20	15·0	
	N.		21·9	341	e 5 0	- 4	9 14	+11	14·6	
Washington		Mar.	21·9	341	4 57	- 7	8 57	- 6	12·4	
Harvard	N.	B.O.	24·0	354			7 55	-109	e 11·2	
	E.	B.O.	24·0	354	--		8 16	-88	12·8	
Ithaca		B.O.	25·0	345	e 6 23	+45	e 11 5	+62	13·0	
Toronto		M.	26·9	342			10 55	+16	12·8	19·9
Ann Arbor	E.	W.	27·3	334	3 25	?	10 7	-39	14·8	20·4
	N.	W.	27·3	334	3 37	?	9 25	-81	14·6	20·4
Ottawa			27·7	348	e 5 58?	- 7	10 33?	-21	e 14·4	
La Paz		Bi.	35·0	180	e 6 55	-18			21·4	22·2
Victoria		M.	53·5	317					28·2	36·7
Coimbra			55·2	53			e 18 41	+77	e 26·4	--
San Fernando			56·7	58	16 55	??	(16 55)	-47	--	--
Eskdalemuir	G.		60·6	36	18 28	??	(18 28)	- 3	30·9	--
Edinburgh	M.		60·7	36	18 25	??	(18 25)	- 7	--	37·9
Shide	M.S.		61·1	42			18 36	- 1	32·2	--
Kew	M.		61·8	41					--	40·4
De Bilt	E.		65·2	40	10 51	+ 5		--	30·4	34·6
	N.		65·2	40	--		19 27	0	e 28·4	29·4
Helwan		M.	88·6	59	48 25	? L			(48·4)	--

Additional records: Georgetown gives eL? = +10·5m., T_0 = 21h.33m.17s.
 Harvard eLE = +10·8m., T_0 = 21h.30m.13s. Ithaca eSE = +10m.58s.,
 T_0 = 21h.34m.12s. Toronto eL = +15·9m. La Paz iP = +7m.32s.
 Victoria L = +33·2m. De Bilt T_0 = 21h.33m.51s.

Oct. 18d. Records also at 0h. (Tokyo), 3h. (Rocca di Papa, Monte Cassino, and Mauritius), 4h. (Monte Cassino and Rocca di Papa), 10h. (Manila), 12h. (Taihoku and Colombo), 19h. (Port au Prince and Vieques).

Oct. 19d. 2h. 0m. 20s. Epicentre 15°·0N. 97°·0W. (as on 1917 Dec. 29d. 22h.).

A = -·118, B = -·959, C = +·259; D = -·993, E = +·122;
 G = -·032, H = -·257, K = -·966.

Very doubtful. There is no complete observation of S and P to give a trustworthy T_0 , since the Tucson (N.) observations would indicate conditions irreconcilable with the Tacubaya observations, and although these have been altered by 12h. the alteration is confirmed by the records of the shock at 3h.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Tacubaya		4·9	334	1 29	+13	--	--	--	4·4
Tucson	E.	21·4	326	e 6 53	+115	--	--	e 7·6	8·7
	N.	21·4	326	e 8 24	+206	--	--	e 9·7	12·7
Lawrence		24·0	3	5 17	-11	--	--	9·4	12·5
Washington		29·6	33	--	--	--	--	17·7	--
Georgetown		29·6	33	--	--	--	--	17·7	--
Toronto		32·4	24	--	--	--	--	e 18·5	19·8
Ithaca		32·5	29	--	--	e 16 10	+234	e 19·3	--
Ottawa		35·3	26	--	--	e 13 10	+10	e 19·7	--
Harvard		35·3	34	--	--	--	--	18·2	--
La Paz		42·5	137	e 9 30	+75	--	--	24·1	27·8
Edinburgh		79·8	35	28 40	?	--	--	--	132·7
Eskdalemuir		79·8	35	22 53	?S	(22 53)	+32	38·2	--
Bidston		80·3	38	23 34	?S	(23 34)	+67	(31·8)	43·4
De Bilt		85·5	37	--	--	e 23 55	+30	e 41·7	43·1

Additional records: Lawrence MN = +17·7m. Tacubaya—a correction of 12h. has been made as at 3h. Harvard L = +21·0m. Ottawa L = +24·7m. De Bilt e = +36m.24s.

1918. Oct. 19d. 3h. 22m. 45s. Epicentre 14°·5N. 91°·0W.

(as on 1917 June 8d.).

A = -·017, B = -·968, C = +·250; D = -1·000, E = +·018;
G = -·004, H = -·250, K = -·968.

Station and Component.	Machine.	\angle	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Tacubaya	—	9·3	304	2 1	-19	—	—	—	4·8
Balboa Hts.	E. B.O.	12·5	115	4 1	+55	—	—	8·0	9·3
	N. B.O.	12·5	115	4 9	+63	—	—	—	8·4
St. Louis	E. W.	24·2	4	—	—	10 45	+57	e 18·0	—
	N. W.	24·2	4	5 33	+3	10 3	+15	11·9	17·4
Vieques	E. B.O.	24·8	78	6 14	+38	—	—	12·7	17·2
	N. B.O.	24·8	78	5 27	-9	—	—	12·7	14·5
Lawrence	W.	24·8	356	5 40	+4	—	—	10·0	10·9
Tucson	N. B.O.	25·4	318	e 5 55	+13	10 24	+13	16·1	17·6
	E. B.O.	25·4	318	e 6 2	-20	10 46	+35	16·2	18·0
Cheltenham	E. B.O.	27·3	25	e 6 5	+4	—	—	—	—
	N. B.O.	27·3	25	e 5 57	-4	e 10 42	-4	e 16·3	19·6
Washington	Mar.	27·3	24	6 0	-1	10 48	+2	16·8	—
Georgetown	—	27·3	24	6 3	+2	10 49	+3	e 12·8?	15·8
Ann Arbor	E. W.	28·5	12	6 21	+8	11 3	-5	15·8	19·4
	N. W.	28·5	12	11 15	+2	11 3	-5	—	19·2
Ithaca	B.O.	30·7	23	7 2	+27	12 35	+49	—	—
Toronto	M.	30·8	17	5 57	-39	11 39	-9	i 18·4	26·6
Northfield	B.O.	31·0	25	e 8 5	+87	—	—	20·8	—
Harvard	E. B.O.	32·8	28	7 35	+40	12 25?	+4	e 16·3	21·8
	N. B.O.	32·8	28	6 31	-24	11 39?	-42	e 16·4	21·8
Ottawa	—	33·5	20	i 6 54	-7	i 10 19	-133	e 15·6	—
Lick	W.	35·4	315	7 14	-3	—	—	—	23·4
Berkeley	—	36·2	316	e 7 16	8	e 13 5	-8	—	24·4
La Paz	Bi.	38·3	143	i 7 30	-10	i 13 31	-11	18·4	21·2
Victoria	M.	43·1	329	7 36	-43	14 59	+10	23·8	31·7
Andalgala	E. M.	48·4	149	14 57	? S	(14 57)	-62	(25·8)	27·6
Cipolletti	M.	57·6	159	16 27	? S	(16 27)	-87	27·6	31·8
Chacarita	M.	58·0	149	—	—	—	—	—	38·2
Honolulu	M.	63·7	287	11 21	+45	20 3	+54	32·2	35·0
Coimbra	—	75·2	52	e 10 48	-62	e 20 32	-56	35·2	44·9
Rio Tinto	M.	76·8	55	39 15	? L	—	—	(39·2)	56·2
Eskdalemuir	G.	76·8	36	12 5	+5	21 50	+3	36·8	47·1
Bidston	M.S.	77·2	38	12 27	+25	22 3	+12	—	51·2
San Fernando	—	77·3	55	21 45	? S	(21 45)	-7	42·2	46·2
Stonyhurst	M.	77·5	37	e 22 9	? S	(e 22 9)	+14	—	48·6
Shide	M.S.	78·7	40	—	—	22 6	-2	38·8	49·1
Kew	M.	79·2	39	—	—	—	—	—	56·2
Paris	—	81·4	42	e 12 51	+24	—	—	35·2	40·2
Uccle	—	82·2	40	e 12 45	+14	e 23 15	+27	e 35·2	50·2
De Bilt	—	82·5	38	e 12 36	+3	22 47	-5	e 39·2	40·3
	N. —	82·5	38	e 12 43	+10	—	—	—	41·3
Barcelona	—	82·8	49	—	—	—	—	e 39·5	47·8
Algiers	B.M.	84·6	53	—	—	e 23 36	+21	47·2	—
Atia	W.	84·7	256	—	—	—	—	39·2	—
Moncalieri	S.	85·8	45	e 13 8	+16	23 17?	-11	40·6	55·8
Zagreb	W.	91·0	42	e 15 15?	+114	24 6	-18	45·2	54·2
Cape Town	M.	114·0	121	19 15	(+41)	35 15	?	60·2	62·7
Riverview	—	120·9	238	e 31 57?	?	—	—	e 56·2	58·1
Zi-ka-wei	—	124·7	324	—	—	e 66 53	? L	(e 66·9)	—
Melbourne	M.	125·6	234	—	—	—	—	61·4	69·2
Adelaide	M.	131·1	235	—	—	—	—	—	70·4
Manila	W.	137·1	311	e 19 43	[+9]	—	—	—	—
Perth, W.A.	M.	149·9	230	—	—	—	—	76·6	—

The Tacubaya records for this and the preceding shock have been diminished by 12h.

Notes continued on next page.

Additional records: Lawrence gives LN? = 10.1m., MN = +10.2m. Ann Arbor, Bosch instrument, PE = +7m.15s., PN = +6m.33s., SE = +10m.51s., SN = +11m.9s., M = +17.2m. Ithaca SN = +12m.36s., T₀ = 3h.22m.48s. Toronto iL = -20.6m., T₀ = 3h.21m.30s. Harvard T₀? = 3h.22m.7s. from L-P. Ottawa, vertical eL? = +16.2m., L = -21.2m., T₀ = 3h.22m.49s. Lick MN = +22.0m., MV = +22.2m. San Fernando MN = +48.2m. Andalgala PE = +18m.51s., SN = +19m.27s., MN = +20.4m. Eskdalemuir SR₁ = +27m.22s., T₀ = 3h.23m.3s. De Bilt eSR₁E = +28m.43s., eE = +32m.8s., eN = +36m.5s., T₀ = 3h.23m.8s. Riverview e = +37m.33s., e? = +39m.51s., e = +44m.3s., MN = +64.1m.

Oct. 19d. Records also at 0h. (Lick), 3h. (Helwan), 5h. (Port au Prince, Mobile, and Manila), 7h. (Rio Tinto and Vieques), 11h. (Manila), 14h. and 15h. (Tacubaya), 21h. (Helwan), 23h. (Tokyo).

Oct. 20d. 5h. 44m. 55s. Epicentre 72°0N. 2°8W. (as on 1917 Aug. 21d. 10h.).

A = +.309, B = -.015, C = -.951; D = -.049, E = -.999;
G = -.950, H = -.046, K = -.309.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	16.1	184	3 35	-18	—	—	—	10.6
Eskdalemuir	16.7	184	3 52	-9	7 29	-18	8.1	—
Bidston	18.6	184	4 35	-11	—	—	—	9.5
De Bilt	20.2	166	—	—	—	—	c 12.1	14.0
Kew	20.6	180	—	—	—	—	—	11.1
Paris	23.3	174	—	—	—	—	12.1	—

Eskdalemuir gives T₀ = 5h.44m.17s.

Oct. 20d. Records also at 1h. (San Fernando), 4h. (Riverview), 7h. (Nagasaki), 15h. (Uccle, Moncalieri, Edinburgh, Eskdalemuir, Shide, Bidston, De Bilt, Kew, Paris, and Rocca di Papa), 18h. (Zagreb), 20h. (Port au Prince).

Oct. 21d. Records at 0h. (San Fernando), 4h. (Nagasaki), 6h. (Vieques (2)), 9h. (Cipolletti), 11h. (Tokyo), 13h. (Port au Prince and Vieques), 18h. (Paris, Bidston, Shide, Edinburgh, Zagreb, Moncalieri, De Bilt, Uccle, Eskdalemuir, and Kew), 19h. (Tokyo), 22h. (Riverview and San Fernando), 23h. (Honolulu).

Oct. 22d. 8h. 7m. 30s. Epicentre 2°1N. 127°8E.

A = -.612, B = -.790, C = -.037.

On trying 5°4N. 125°2E. as on several days in August it was found that this shock cannot have been from this origin.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	14.2	332	e 3 30	-1	—	—	6.1	6.2
Batavia	22.5	248	5 10	-1	9 13	-2	—	10.5
Riverview	42.1	150	—	—	e 15 12	+36	—	18.9
Helwan	94.5	300	24 30	?S	(24 30)	-31	—	—
De Bilt	107.6	326	—	—	e 24 48	-138	e 54.5	—
Edinburgh	109.7	334	50 0	?L	—	—	(50.0)	—

Additional records: Manila gives MN = -6.3m. Batavia T₀ = 8h.7m.36s. Riverview MN = +17.4m.

Oct. 22d. Records also at 5h. (Zagreb), 9h. (Honolulu), 10h. (Honolulu, Perth, W.A., and Riverview), 11h. (Edinburgh and De Bilt), 15h. (Zagreb and Rocca di Papa), 18h. (De Bilt), 19h. (San Fernando, Mauritius, Colombo, and Helwan), 20h. (De Bilt), 21h. (Helwan and Zi-ka-wei), 23h. (Tokyo).

Oct. 23d. Records at 11h. (Tokyo), 14h. (Vieques and Port au Prince), 20h. (Taihoku), 21h. (Coimbra).

Oct. 24d. 19h. 13m. 20s. Epicentre $0^{\circ}38'. 138^{\circ}8'E.$ (as on 1914 May 26d.).

A = -0.756, B = +0.659, C = -0.005; D = +0.659, E = +0.752;

G = +0.004, H = -0.003, K = -1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	23.2	311	e 9 18	?S	(e 9 18)	-11	—	11.7
Sydney	35.5	162	13 10	?S	(13 10)	+7	17.0	18.0
Riverview	35.5	162	—	—	e 13 1	-2	e 17.1	18.2
Melbourne	37.9	172	—	—	14 40	+63	20.3	21.2
Honolulu	65.2	66	e 19 40	?S	(e 19 40)	+13	32.7	37.7
De Bilt	E. 115.3	330	—	—	e 24 7	?	e 63.7	86.8
	N. 115.3	330	—	—	—	—	e 66.7	87.1
San Fernando	131.5	322	32 40	?S	(32 40)	+149	—	—

Additional records: Manila gives MN = +11.6m. Sydney gives S = +15m.10s. (SR₁). Riverview PR₁? = +8m.57s., eS = +12m.58s., eSR₁? = +14m.33s., MN = +22.0m. Melbourne SR₁ = +17m.34s.

Oct. 24d. Records also at 3h. (De Bilt), 7h., 9h., and 10h. (Manila), 16h. (Tokyo), 18h. (Rocca di Papa), 19h. and 21h. (Manila), 22h. (Vieques), 23h. (Port au Prince).

1918. Oct. 25d. 3h. 42m. 50s. Epicentre $18^{\circ}5'N. 68^{\circ}0'W.$

(as on 1918 Oct. 11d. to 18d.).

A = +0.355, B = -0.879, C = +0.317; D = -0.927, E = -0.375;

G = +0.119, H = -0.294, K = -0.948.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Vieques	E. B.O.	2.5	98	0 39	0	—	—	0.7	1.2
Port au Prince	B.O.	4.1	271	i 1 22	+18	1 29	-24	1.6	2.4
Balboa Hts.	E. B.O.	14.7	231	3 42	+7	—	—	6.7	6.9
Cheltenham	N. B.O.	21.7	341	5 37	+36	9 38	+39	e 13.5	18.0
Georgetown	E. —	21.9	341	5 8	+4	9 26	+23	e 10.9	—
	N. —	21.9	341	i 5 8	+4	9 19	+16	e 11.0	—
Washington	Mar.	21.9	341	5 6	+2	9 4	+1	10.4	—
Harvard	E. B.O.	24.0	354	5 30	-2	10 45	+1	10.9	—
	N. B.O.	24.0	354	i 5 57	-29	10 19	+35	e 12.7	14.2
Ithaca	B.O.	25.0	345	5 53	-15	10 21	+18	12.2	—
Northfield	B.O.	26.0	352	5 30	-18	10 17	-5	12.2	—
Toronto	M.	26.9	342	e 6 28	+31	e 11 16	+37	e 12.7	20.8
Ann Arbor	E. B.	27.3	334	5 40	-21	10 28	-18	12.9	20.2
	N. B.	27.3	334	5 52	-9	10 34	-12	13.2	21.2
Ottawa	—	27.7	348	6 0	-5	e 10 46	-8	e 12.2	—
St. Louis	N. W.	27.9	321	6 4	-3	10 52	-5	13.3	20.2
La Quiaca	E. M.	40.7	177	—	—	28 34	? L.	(28.6)	43.7
	N. M.	40.7	177	—	—	28 46	? L.	(28.8)	38.3
Tucson	N. B.O.	40.8	298	9 44	? PR ₁	—	—	24.2	30.7
	E. B.O.	40.8	298	9 59	? PR ₁	—	—	23.2	35.3
Pilar	E. M.	50.3	177	14 34	?	—	—	—	35.0
	N. M.	50.3	177	9 28	+19	—	—	—	36.3
Berkeley	—	50.8	304	e 8 0	?	—	—	—	—
Victoria	M.	53.5	317	9 28	-2	17 11	+8	28.7	36.7
Chacarita	M.	53.8	170	—	—	31 52	? L.	(31.9)	34.2
Coinbra	—	55.2	53	9 32	-8	17 20	-4	25.0	27.0
San Fernando	—	56.7	58	9 58	+8	17 10	-32	29.9	36.2
Cipolletti	M.	57.4	180	17 40	? S	(17 40)	-11	(34.2)	40.6
Bidston	M.S.	60.4	38	10 27	+12	19 13?	+45	—	27.2
Eskdalemuir	G.	60.6	36	10 20	+4	18 28	-3	28.2	32.7
Edinburgh	M.	60.7	36	10 10	-7	—	—	—	41.2
Stonyhurst	M.	60.8	38	i 19 52	? S	(i 19 52)	+79	i 31.9	35.9
Slide	M.S.	61.1	42	10 21	+1	18 38	+1	29.1	31.8
Oxford	M.S.	61.2	40	10 20	+0	18 37	-1	—	—

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Dyce	Ma.	61.5	34	10 10?	-12	18 49	+ 7	—	—
Kew	M.	61.8	41	19 10	? S	(19 10)	+24	—	40.2
Tortosa	—	62.0	51	10 30	+ 5	18 50	+ 2	29.8	36.7
Barcelona	—	63.2	52	e 10 26	- 7	i 19 0	- 3	—	32.3
Paris	—	63.5	43	i 10 40	+ 5	i 19 6	- 1	26.2	26.2
Algiers	B.M.	64.1	59	e 10 41	+ 2	19 11	- 3	27.2	—
Uccle	—	64.7	41	e 10 43	0	e 19 22	+ 1	e 26.2	29.0
De Bilt	N.	65.2	40	10 52	+ 6	19 31	+ 4	e 28.2	29.9
	E.	65.2	40	—	—	—	—	e 29.6	34.3
Moncalieri	S.	67.0	48	10 50	- 8	i 19 54	+ 4	27.6	—
Zurich	—	67.5	45	e 11 5	+ 4	19 57	+ 1	—	—
Rocca di Papa	Ag.	71.0	51	11 24	+ 1	20 39	+ 1	e 32.8	35.6
Zagreb	W.	72.7	47	e 11 35	+ 1	i 20 55	- 3	32.2	46.2
Honolulu	M.	83.4	290	e 12 10	-28	i 23 10	+ 9	40.2	51.4
Helwan	M.	88.6	59	13 4	- 4	—	—	—	67.6
Cape Town	M.	97.4	125	25 58	? S	(25 58)	+28	—	52.5
Mauritius	M.	129.2	98	32 10	? S	—	—	64.6	69.7
Zi-ka-wei	—	129.5	350	e 22 23	? PR ₁	—	—	—	—
Melbourne	M.	145.4	230	—	—	—	—	72.8	83.2
Manila	W.	145.8	344	e 19 50	[0]	—	—	—	—

Additional records: Vieques gives ePN = +0m.36s. Balboa Heights LN = +6.9m., MN = +7.1m. Georgetown LE = +12.6m., LN = +14.4m., T₀ = 3h.42m.44s. Washington L = +14.2m., T₀ = 3h.42m.58s. Harvard eN = +6m.53s., eN? = +10m.27s., LE = +14.4m., LE = +18.8m., MN = +21.6m., T₀ = 3h.42m.59s. Ithaca SE = +10m.22s., T₀ = 3h.43m.7s. Northfield L = +15.2m., T₀ = 3h.42m.19s. Toronto eL = +17.0m., T₀ = 3h.43m.12s. Ottawa e = +11m.50s., L = +20.2m., T₀ = 3h.42m.50s. San Fernando MN = +32.4m., T₀ = 3h.43m.45s. Cipolletti records S and L waves as P and S respectively. Stonyhurst gives eP = +11m.28s. and iS = +23m.46s. Barcelona MN = +28.4m., T₀ = 3h.42m.43s. De Bilt T₀ = 3h.43m.4s. Moncalieri S = +19m.35s., T₀ = 3h.42m.56s. Zagreb iP = +11m.38s., i = +13m.38s., MNW = +43.2m.

Oct. 25d. 19h. 3m. 35s. Epicentre 5°.4'N. 125°.2'E. (as on 1918 Aug. 21d. 0h.).

A = -.574, B = +.813, C = +.094; D = +.817, E = +.576;
G = -.054, H = +.077, K = -.996.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	10.1	336	e 2 41	+10	—	—	6.2	7.4
Batavia	21.7	238	e 4 57	- 4	8 52	- 7	—	11.4
Zi-ka-wei	26.0	353	e 17 1	? L	e 21 25	? L (e 17.0)	—	—
Colombo	45.2	274	31 25	?	—	—	—	—
Riverview	46.3	150	—	—	—	—	e 18.4	19.7
Helwan	90.7	298	26 25	? S	(26 25)	+124	—	—
De Bilt	E. 103.4	327	—	—	e 41 1	?	e 54.4	57.1
	N. 103.4	327	—	—	e 48 49	? L (e 48.8)	—	57.3
Eskdalemuir	105.9	331	—	—	—	—	50.4	—

Additional records: Manila gives MN = +7.0m. Batavia T₀ = 19h.3m.38s.
Riverview MN = +19.0m.

Oct. 25d. Records also at 1h. (Tokyo), 3h. (Pompei), 5h. (Colombo and Kodai-kanal), 6h. (Mobile), 14h. (Tokyo), 17h. (Denver), 21h. (San Fernando), 22h. (Rocca di Papa), 23h. (Zi-ka-wei).

Oct. 26d. 2h. 13m. 30s. At 72°·0N. 2°·8W. (as on 1918 Oct. 20d. 5h.).

A = +·309, B = -·015, C = +·951; D = -·049, E = -·999;
G = +·950, H = -·046, K = -·309.

(Very doubtful.)

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Bidston	18·6	184	4 18	- 6	—	—	—	9·7
De Bilt	20·2	166	—	—	—	—	e 9·6	11·5
Kew	20·6	180	—	—	—	—	—	10·5
Shide	21·7	177	—	—	8 36	-23	9·8	10·7
Paris	23·3	174	—	—	e 8 52	-39	11·5	12·5
Graz	26·3	151	e 6 30?	+39	—	—	—	—
Moncalieri	27·5	164	7 14	+71	—	—	14·0	—
Zagreb	27·6	151	—	—	—	—	25·5	27·0
Rocca di Papa	31·2	157	e 7 45	+65	—	—	17·4	—
Rio Tinto	34·3	185	9 30	+143	—	—	—	9·5
Helwan	45·9	138	29 30	?L	—	—	(29·5)	—

Eskdalemuir ($\Delta = 16^{\circ}·7$) gives simply 2h.19m.30s. to 2h.40m.0s.

Oct. 26d. 16h. 58m. 40s. Epicentre 5°·4N. 125°·2E. (as on Oct. 25d.).

A = -·574, B = +·813, C = +·094.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	10·1	336	e 2 36	+ 5	4 2	-30	4·9	7·6
Batavia	21·7	238	e 4 20	-41	—	—	—	9·3
Zi-ka-wei	26·0	353	e 5 46	- 2	e 10 4	-18	—	—
Helwan	90·7	298	60 20	?L	—	—	(60·3)	—
De Bilt	E. 103·4	327	—	—	—	—	e 54·3	58·6
N. 103·4	327	—	—	—	—	—	e 56·3	58·7
Eskdalemuir	105·9	331	—	—	—	—	23·3	—

Manila gives MN = +6·7m.

Oct. 26d. Records also at 0h. (Algiers), 6h. (Helwan and Tokyo), 7h. (Tokyo), 12h. (Tacubaya (2)), 18h. (Manila), 23h. (De Bilt).

1918. Oct. 27d. 15h. 27m. 10s. Epicentre 10°·5S. 161°·0E.

(as on 1917 Nov. 30.).

A = -·930, B = +·320, C = -·182; D = +·326, E = +·946;

G = +·172, H = -·059, K = -·983.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
Riverview	—	25·0	199	e 5 28	-10	i 9 52	-11	e 12·1	14·6
Sydney	M.	25·0	199	5 20	-18	9 50	-13	12·3	14·6
Apia	W.	26·8	100	5 37	-19	9 50	-47	10·2	12·8
Melbourne	M.	30·9	204	6 2	-35	11 38	-12	17·7	18·8
Adelaide	M.	31·9	216	5 29	-77	10 59	-68	14·7	17·8
Manila	W.	47·0	302	e 8 57	+10	15 26	-15	20·8	21·0
Tokyo	O.	50·3	338	9 9	0	16 15	- 8	22·8	—
Honolulu	M.	51·3	52	i 9 50	+35	i 18 32	- 3	23·9	31·3
Osaka	O.	51·3	334	9 7	- 8	16 17	-18	22·5	27·7
Kobe	O.	51·4	334	e 10 30	+74	—	—	23·6	25·7
Taihoku	O.	52·4	315	16 14	?S	(18 14)	-35	26·6	27·4
Misusawa	E. O.	53·0	341	9 21	- 5	16 41	-15	—	—
	N. O.	53·0	341	9 25	- 1	16 46	-10	—	—
Batavia	W.	53·7	270	e 9 31	0	17 1	- 4	e 28·8	17·8
Zi-ka-wei	—	56·4	319	e 11 44	?PR ₁	e 17 32	- 7	—	—
Ootomari	O.	59·4	344	e 18 23	?S	(e 18 23)	+ 7	—	—
Calcutta	E. O.E.	78·4	297	12 8	- 1	22 8	+ 3	—	—
Colombo	M.	82·4	278	22 14	?S	(22 14)	-36	—	32·4
Kodaikanal	M.	85·7	281	22 38	?S	(22 38)	-49	57·5	60·5
Berkeley	—	86·2	50	e 12 44	-10	—	—	e 35·4	—

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O—C.	S.	O—C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Victoria	M.	88.6	40	23 55	? S	(23 55)	— 4	40.2	53.5
Bombay	O.E.	91.8	290	23 34	? S	(23 34)	— 59	—	50.5
Tucson	B.O.	94.0	58	—	—	—	—	e 43.3	47.3
Mauritius	N. M.	98.5	248	12 50	— 73	—	—	—	55.3
	E. M.	98.5	248	19 14	? PR ₁	—	—	53.2	56.2
Cipolletti	M.	112.6	139	60 20	? L	—	—	(60.3)	66.9
Ann Arbor	E. B.	115.7	47	—	—	27 26	— 50	56.8	—
Toronto	M.	118.5	46	29 8?	? S	(29 8?)	+ 30	57.6	71.6
Ottawa	—	120.5	42	—	—	(e 28 13)	— 40	e 61.8	—
Ithaca	B.O.	120.8	46	e 21 20	? PR ₁	e 27 20	— 95	e 57.8	—
Cheltenham	B.O.	121.2	50	—	—	—	—	e 67.8	—
Georgetown	—	121.3	50	—	—	e 34 10	? SR ₁	59.2	—
Washington	Mar.	121.3	50	—	—	—	—	e 63.8	—
Cape Town	M.	123.1	218	20 44	? PR ₁	—	—	—	63.7
Harvard	B.O.	124.6	44	—	—	32 50?	? e 59.0?	—	—
Helwan	M.	129.8	300	21 26	? PR ₁	—	—	—	—
Budapest	—	131.1	328	22 36	? PR ₁	—	—	—	—
Dyce	N. Ma.	131.5	350	i 22 52	? PR ₁	—	—	—	69.7
Edinburgh	M.	132.9	349	22 50	? PR ₁	—	—	—	—
Athens	—	133.0	315	e 22 46	? PR ₁	—	—	—	—
Graz	N. W.	133.3	330	21 50	? PR ₁	33 50?	? e 59.8	—	—
Zagreb	W.	133.8	329	e 19 25	[— 2]	—	—	67.8	76.8
De Bilt	E. —	134.0	339	(e 22 2)	? PR ₁	—	—	e 59.8	62.9
	N. —	134.0	339	e 22 51	? PR ₁	—	—	e 66.8	67.4
Stonyhurst	M.	134.7	348	i 23 2	? PR ₁	57 32	? e 71.7	84.6	—
Hohenheim	—	135.0	335	e 19 19	[— 11]	—	—	—	—
Bidston	M.S.	135.2	348	46 20	? e	—	—	—	67.8
Uccle	—	135.4	340	e 19 25	[— 6]	—	—	e 67.8	73.8
Pola	W.	135.6	329	—	—	e 70 30	? L	e 82.5	83.7
Kew	M.	136.3	345	71 50	? L	—	—	(71.8)	96.8
Shide	M.S.	137.2	344	—	—	—	—	64.2	80.4
Paris	—	137.7	340	e 22 14	? PR ₁	—	—	61.8	75.8
Rocca di Papa	Ag.	138.2	323	e 22 23	? PR ₁	—	—	e 76.6	—
	Ag.	138.2	323	e 22 19	? PR ₁	—	—	e 70.2	86.0
Moncalieri	S.	138.6	331	e 22 40?	? PR ₁	32 10	+ 74	46.0	79.4
Barcelona	—	143.9	332	e 22 46	? PR ₁	—	—	e 66.8	86.7
Tortosa	—	145.1	334	19 42	[— 6]	—	—	62.8	88.7
Algiers	B.M.	147.0	324	19 45	[— 6]	—	—	62.8	84.8
Coimbra	—	148.9	346	19 58	[+ 4]	32 57?	+ 65	71.8	83.6
Rio Tinto	M.	150.6	340	34 50	? S	(34 50)	? e	—	—
San Fernando	—	151.6	338	21 50	? PR ₁	—	—	—	89.8

Additional records: Riverview gives $iP = +5m.30s.$, $i = +5m.43s.$, $PS = +10m.17s.$, $MN = +13.4m.$, $MZ = +13.3m.$, $T_0 = 15h.26m.58s.$, Epicentre $11^\circ.5S. 162^\circ.5E.$ Apia gives its records as 16h. instead of 15h. Melbourne $SR_1 = +14m.20s.$, $SR_2 = +15m.26s.$ Adelaide $SR_1 = +13m.39s.$, $M = +19.9m.$ Manila $MN = +21.9m.$ Osaka $MN = +28.6m.$, $T_0 = 15h.27m.16s.$ Kobe $MN = +25.0m.$ Taihoku $S = +22m.12s.$ Batavia $T_0 = 15h.27m.17s.$ Colombo $M = +65.4m.$ Victoria gives $S = +29m.52s.$, possibly SR_1 . Ann Arbor $SN = +26m.50s.$ Toronto $e = 15h.29m.48s.$ Perhaps intended for a T_0 . $e = +23m.8s.$ and $+42m.8s.$, $L = +59.3m.$, $eL = +61.6m.$ Ottawa records S as PR_1 , and gives $eS = +36m.33s.$, $L = +75.8m.$ Ithaca $e = +30m.5s.$ and $+36m.50s.$ Georgetown $LN = +61.2m.$ Harvard $eE = +37m.9s.$ and $+46m.9s.$, $LE = +61.4m.$ Athens $eN = +22m.55s.$ Zagreb $i = +22m.47s.$ and $+23m.48s.$, $eNE = +55m.50s.$, $MNW = +69.8m.$ Stonyhurst $eP = +46m.2s.$ Paris $iPE = +53.3m.$ (given one hour early). Coimbra $eLN = +48.3m.$, $LE = +59.8m.$, $MN = +85.8m.$ San Fernando $MN = +95.8m.$

1918. Oct. 27d. 17h. 6m. 30s. Epicentre $1^{\circ}25'S. 149^{\circ}5'E.$

(as on 1918 June 24d.).

 $A = -.862, B = +.508, C = -.021; D = -.508, E = +.862;$
 $G = +.011, H = -.018, K = -1.000.$

T_0 is chosen to suit the mean values of $S-P$, but it makes the mean residuals of P and S both negative. This might be due to deep focus, but there is no indication of this in the anticentric residuals: nor again do they suggest a diminution of T_0 .

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Manila	W.	32.4	302	e 6 47	- 5	12 8	- 6	14.9	18.9
Riverview	—	32.7	178	e 6 57	+ 3	i 12 32	+13	e 16.5	21.5
Sydney	M.	32.7	178	11 54	? S	11 54	-25	17.0	18.5
Adelaide	M.	35.3	195	6 49	-27	12 44	-16	17.0	21.5
Melbourne	M.	36.8	188	13 0	? S	13 0	-21	22.5	23.0
Taihoku	O.	37.7	318	e 6 52	-44	12 38	-56	14.8	18.6
Tokyo	O.	38.0	349	7 48	+10	9 6	? PR ₁	16.5	—
Osaka	O.	38.2	342	7 39	- 1	13 3	-38	16.1	16.4
Kobe	O.	38.3	342	e 8 25	? PR ₁	—	—	—	16.3
Apia	W.	40.4	110	8 11	+13	e 14 42	+29	22.5	63.5
Mizusawa	O.	41.1	351	7 59	- 5	13 47	-35	—	—
Zi-ka-wei	E.	42.0	323	8 2	- 9	14 17	-18	19.5	23.1
	N.	42.0	323	—	—	—	—	19.6	24.0
Batavia	W.	42.9	264	8 7	-10	—	—	—	17.5
Ootomari	O.	48.3	354	8 50	- 6	—	—	—	—
Honolulu	M.	55.9	63	e 12 48	? PR ₁	i 18 12	+39	e 25.0	34.5
Calcutta	O.E.	64.1	296	10 48	+ 9	19 18	+ 4	—	—
Colombo	M.	70.0	278	10 42?	-35	(20 18)	- 8	20.3	34.4
Kodaikanal	M.	72.7	281	20 30	? S	(20 30)	-28	34.5	55.4
Simla	O.E.	75.7	304	e 11 54	+ 1	21 18	-16	e 29.0	—
Bombay	O.E.	77.8	290	12 19	+13	—	—	—	43.9
Berkeley	—	89.0	51	—	—	e 22 57	-66	—	—
Victoria	M.	89.1	41	23 31	? S	(23 31)	-33	38.8	52.0
Mauritius	N.	91.1	250	—	—	—	—	28.1	35.1
	E.	91.1	250	12 48	-34	—	—	27.5	39.9
Tucson	B.O.	98.9	57	—	—	—	—	e 54.3	68.2
Lemberg	B.O.	112.9	325	e 19 48	? PR ₁	e 29 18	+85	e 58.7	64.5
Helwan	M.	114.8	303	—	—	—	—	—	77.3
Budapest	E.	116.9	325	20 20	? PR ₁	29 30	+65	—	—
Ann Arbor	E.	B.	117.2	40	—	20 36?	? PR ₁	54.5	65.5
	N.	B.	117.2	40	—	20 30?	? PR ₁	54.0	66.5
	E.	W.	117.2	40	10 24	?	—	55.5	65.5
	N.	W.	117.2	40	—	20 42?	? PR ₁	54.5	68.5
Athens	—	118.2	315	e 20 16	? PR ₁	e 31 0	+144	e 60.2	—
Graz	W.	119.2	327	e 20 28	? PR ₁	i 30 26	+103	—	—
Toronto	M.	119.3	38	—	—	—	—	48.8	82.4
Dyce	N.	119.6	344	e 20 34	? PR ₁	i 30 22	+96	—	63.4
Zagreb	W.	120.3	325	e 20 11	? PR ₁	e 36 30	? SR ₁	62.5	67.5
Ottawa	—	120.6	34	e 20 51	? PR ₁	e 30 41	+107	e 59.4	—
De Bilt	—	121.0	335	(e 19 57)	? PR ₁	30 37	+100	e 58.5	63.6
Edinburgh	M.	121.0	344	—	—	—	—	—	74.0
Pola	W.	121.4	325	e 21 10	? PR ₁	(e 32 10)	?	e 32.2	79.3
Hohenheim	—	121.5	330	19 0	[+ 4]	30 45?	+104	—	—
Ithaca	B.O.	121.8	37	—	—	e 29 30	+27	e 58.0	—
Uccle	—	122.3	334	e 19 0	[+ 1]	30 48	+102	e 58.5	77.5
Stonyhurst	M.	122.4	340	—	—	—	—	—	75.6
Zurich	—	122.7	330	e 19 31	[+31]	—	—	—	—
Bidston	M.S.	123.0	340	36 30	?	45 30	?	—	72.5
Georgetown	—	123.2	41	e 21 6	? PR ₁	25 52?	?	—	—
Washington	Mar.	123.2	41	22 30?	? PR ₁	25 57?	?	e 63.5?	—
Kew	M.	123.6	339	65 30?	? L	—	—	(65.5)	81.5
Rocen di Papa	Ag.	123.9	321	e 21 11	? PR ₁	e 28 45	-33	e 71.1	81.5
Paris	—	124.5	334	e 21 5	? PR ₁	i 31 9	+106	62.5	63.5
Shide	M.S.	124.6	339	—	—	—	—	59.5	74.3
Moncalieri	S.	124.7	329	21 14	? PR ₁	i 33 14	?	51.4	76.2
Harvard	E.	B.O.	125.1	35	e 15 53	-13	21 45	? PR ₁	e 25.4
	E.	B.O.	125.1	35	e 16 23	+17	21 45	? PR ₁	25.4
Cipolletti	M.	127.0	141	66 30	? L	72 6	?	(66.5)	89.6
Barcelona	—	130.1	329	e 21 27	? PR ₁	—	—	e 60.3	74.3
Tortosa	—	131.4	330	10 45	23	—	—	54.8	78.1
Algiers	B.M.	132.8	322	21 59	? PR ₁	32 10	+110	54.5	70.5
Coimbra	N.	—	136.1	337	22 20	? PR ₁	34 17?	e 57.0	76.0
	E.	—	136.1	337	21 0	? PR ₁	i 41 3	? SR ₁	70.1
Rio Tinto	M.	137.3	331	—	—	—	—	—	87.5

For Notes see next page.

NOTES TO OCT. 27d. 17h. 6m. 30s.

Additional records : Manila gives also MN = +18.1m. Riverview i = +7m.9s., iPR₁ = +8m.26s., PS = +13m.5s., T₀ = 17h.6m.25s. Sydney S = +15m.18s. Adelaide PR₁ = +8m.39s., SR₁ = +15m.29s., M = +25.2m. Melbourne S = +18m.54s., SR₁ = +20m.18s., SR₂ = +20m.48s. Osaka MN = +20.9m., T₀ = 17h.7m.21s. Kobe MN = +21.8m. Apia gives its records as 18h. instead of 17h. Mizusawa T₀ = 17h.7m.10s. Zi-ka-wei SR₁N = +17m.44s., SR₁E = +17m.46s. Colombo M = +36.1m. Toronto gives L = +54.7m., eL = +71.3m., and L = +76.1m. Zagreb iNE = +20m.37s., and +26m.10s., MNW = +72.5m. Ottawa L = +83.5m. and +93.5m. De Bilt eSR₁ = +37m.16s. Edinburgh M = 79.2m. Uccle e = +39m.24s. Washington L? = +78.5m., L = +86.5m. Rocca di Papa eP = +20m.31s., L = +72.4m., M = +80.5m. Paris PR₂ = +28m.8s., SR₁ = +38m.9s. Moncalieri MN = +77.0m. Harvard gives several other records. T₀ = 7h.12m.16s. and 17h.22m.36s. Barcelona MN = +67.0m., M₂ = +77.6m.

Oct. 27d. Records also at 0h. (San Fernando), 8h. (De Bilt, Zagreb, and Athens), 10h. (Tokyo), 16h. (Tokyo), 19h. (Toronto, Pompeii, and Victoria).

Oct. 28d. Records at 1h. (Denver and San Fernando), 11h. (Athens), 12h. (Sydney and Riverview), 13h. (Manila, Colombo, and Melbourne), 14h. (Manila, Helwan, and De Bilt), 17h. (De Bilt), 22h. (San Fernando).

Oct. 29d. 12h. 26m. 0s. Epicentre 8° 0'N. 84° 0'W. (as on 1917 June 30d.).

A = +.104, B = -.985, C = +.139; D = -.995, E = -.105;
G = +.015, H = -.138, K = -.990.

The values of S - P for Washington and Ottawa give $\Delta = 18^{\circ}.2$ and $31^{\circ}.3$, with closely accordant T₀ = 12h.27m.2s. But these stations are only 6° apart, so that one of the Δ s must be wrong. Further the T₀ is later than the record at Balboa Heights, so that both are probably in error. The solution given is a compromise.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	4.5	78	0 54	-16	—	—	3.4	3.8
Cheltenham	31.4	10	e 7 55	?PR ₁	—	—	e 16.0	18.0
Washington	31.5	10	5 22	-81	8 47	?	16.0	—
Ithaca	35.0	10	e 11 20	?S (e 11 20)	—	-95	e 17.5	—
Toronto	35.9	6	—	—	—	—	17.8	21.0
Ottawa	38.1	10	7 41	+ 2	e 12 56	-43	20.0	—
Victoria	52.3	328	—	—	—	—	24.8	33.2
Honolulu	72.3	290	—	—	—	—	e 33.0	36.0
San Fernando	75.4	54	26 0	?SR ₁	—	—	(36.0)	49.0
Eskdalemuir	78.1	35	—	—	—	—	34.0	—
Edinburgh	78.3	34	35 0	?L	—	—	(35.0)	49.5
Kew	79.8	39	—	—	—	—	—	29.0
Paris	81.7	42	—	—	—	—	e 32.0	—
De Bilt	E. 83.2	38	—	—	22 57	- 2	e 42.0	43.0
	N. 83.2	38	—	—	—	—	e 40.0	40.6
Graz	90.6	42	—	—	—	—	e 50.0	—
Helwan	107.4	55	28 0	?S (28 0)	+55	—	—	—

Additional records : Balboa Heights gives PN = +53s., MN = +5.9m. Ithaca e = +15m.0s. Ottawa eN = +11m.0s., e = +14m.26s., eN = +17m.0s., L = +29.0m., and +40.0m. San Fernando MN = +44.0m. The L is given as another P.

Oct. 29d. Records also at 5h. (Mizusawa), 11h. (Ann Arbor), 15h. (Tokyo), 17h. (De Bilt and Manila), 18h. (Rocca di Papa), 20h. (San Fernando).

Oct. 30d. Records at 12h. (Harvard and Georgetown), 13h. (Coimbra), 22h. (San Fernando).

Oct. 31d. Records at 7h. (Kobe), 8h. (Mizusawa), 9h. (Taihoku), 10h. (Zagreb), 13h. (Mizusawa), 17h. (De Bilt and Taihoku), 18h. (Kobe and Osaka), 20h. (Mizusawa), 23h. (San Fernando).

Nov. 1d. Records at 1h. (Mizusawa and Tokyo), 2h. (Manila), 15h. (Riverview), 16h. (Helwan), 17h. (Tokyo), 18h. (Manila), 19h. (Tokyo), 20h. (Colombo), 23h. (San Fernando).

Nov. 2d. 10h. 1m. 10s. Epicentre Isle of Hawaii, $19^{\circ}4N$. $155^{\circ}3W$.

$A = -.857$, $B = -.395$, $C = +.333$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Honolulu	3.3	306	(0 50)	- 2	—	—	0.8	2.7
Berkeley	34.0	49	—	—	e 12 40	0	—	—
Ann Arbor	E. 63.6	51	—	—	26 20	?SR ₁	34.4	35.8
N. 63.6	51	—	—	—	23 50	?SR ₁	33.9	35.8
Toronto	66.6	49	—	—	—	—	44.2	—
Georgetown	69.0	54	—	—	—	—	32.8	—
Washington	69.0	54	—	—	e 32 2	?	33.0	—
Ottawa	69.1	47	—	—	e 27 14?	?SR ₁	36.8	—
Cheltenham	69.1	55	—	—	—	—	37.3	39.3
Manila	79.5	281	e 12 16	0	—	—	—	—
Cipolletti	100.0	129	53 32	?L	—	—	(53.5)	59.3
Edinburgh	101.0	14	27 50	?S	(27 50)	+105	—	62.3
Helwan	130.3	353	100 50	?L	—	—	(100.8)	—

Additional records : Toronto gives $L = +53.2m$. Georgetown $LE = +36.8m$.
Ottawa $eN\ell = +32m.20s.$, $e = +33m.50s.$

Nov. 2d. Records also at 0h. (Batavia), 3h. (Taihoku, Hokoto, and Manila), 7h. (Manila), 12h. (Rocca di Papa and La Paz), 13h. (La Paz), 20h. (Manila), 23h. (San Fernando).

1918. Nov. 3d. 11h. 13m. 50s. Epicentre $48^{\circ}2S$. $165^{\circ}8E$.

$A = -.646$, $B = +.164$, $C = -.745$; $D = +.245$, $E = +.969$;
 $G = +.723$, $H = -.183$, $K = -.666$.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview		18.0	318	i 4 22	+ 5	e 7 53	+13	e 8.7	10.0
Sydney	M.	18.0	318	4 22	+ 5	(7 40)	0	7.7	8.2
Melbourne	M.	18.3	297	i 4 10	-11	7 28	-19	8.7	8.2
Adelaide	M.	24.1	294	5 33	+ 4	9 43	- 3	10.5	13.3
Apia	W.	39.1	38	e 7 46	- 1	i 14 4	+11	e 18.4	—
Batavia	W.	64.9	290	10 41	- 3	19 17	- 7	e 34.2	37.2
Manila	W.	74.3	317	e 11 45	+ 1	—	—	—	—
Honolulu	M.	76.7	35	—	—	e 40 4	?L	42.3	46.7
Cipolletti	M.	80.6	141	20 46	?S	(20 46)	-104	43.2	47.3
Zi-ka-wei	—	88.7	324	e 12 56	-13	—	—	—	—
Colombo	M.	92.4	278	23 40	?S	(23 40)	-59	—	30.2
Cape Town	M.	92.8	209	29 10	?SR ₁	—	—	—	43.7
Kodaikanal	M.	96.5	279	18 10	?PR ₁	—	—	—	—
La Paz	Bi.	99.5	130	e 14 6	- 2	24 41	-70	47.2	49.5
Berkeley	—	107.2	50	—	—	—	—	e 46.7	—
Victoria	M.	114.4	43	29 44	?S	(29 44)	+99	52.7	70.2
Ann Arbor	B.	132.4	70	—	—	—	—	66.2	72.2
Washington	Mar.	134.9	77	e 22 10	?PR ₁	—	—	—	—
Georgetown	—	134.9	77	—	—	—	—	74.2	—
Toronto	M.	135.8	70	—	—	—	—	71.4	77.0
Ithaca	B.O.	137.0	73	—	—	—	—	e 73.2	—
Ottawa	—	139.0	70	e 22 40	?PR ₁	—	—	e 67.2	—
Harvard	B.O.	140.5	75	—	—	e 55 22	?	e 76.3	—
Helwan	M.	140.9	260	22 10	?PR ₁	—	—	—	—

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Zagreb	W.	159.4	275	e 20 44	[+37]	—	—	82.2	122.2
Graz	W.	160.0	278	e 20 56	[+48]	—	—	—	—
Algiers	B.M.	163.0	234	e 24 37	? PR ₁	32 22	?	92.2	110.2
Moncalieri	S.	164.6	266	20 14	[— 2]	30 48	?	82.1	—
San Fernando	—	166.9	209	50 58	?	—	—	96.7	98.7
De Bilt	E.	167.0	295	20 52	[+39]	e 38 52	?	e 79.2	80.3
	N.	167.0	295	21 12	[+59]	e 37 27	?	—	89.7
Uccle	—	167.7	289	—	—	—	—	e 92.2	112.2
Rio Tinto	M.	168.2	210	89 10	? L	—	—	(89.2)	115.7
Paris	—	168.9	280	27 10	?	—	—	100.2	107.2
Edinburgh	M.	169.7	322	21 10	[+55]	—	—	—	109.7
Eskdalemuir	G.	170.2	320	i 20 13	?	i 35 52	?	46.2	—
	Z.	170.2	320	i 19 54	[— 21]	i 25 3	? PR ₁	—	—
Kew	M.	170.4	295	—	—	—	—	—	111.2
Oxford	M.S.	171.0	298	—	—	32 24	?	—	—
Coimbra	—	171.0	209	e 24 10	? PR ₁	37 38	?	e 88.2	—
Bidston	M.S.	171.2	310	19 10	[— 65]	—	—	—	98.2
Shide	M.S.	171.2	292	—	—	32 24	—	—	—

Additional records: Riverview gives $eP = +4m.21s.$, $iPR_2 = +5m.36s.$, $iS = +7m.59s.$, $PS = +8m.14s.$, $MN = +9.4m.$, $MZ = +9.9m.$, $T_0 = 11h.13m.47s.$
 Adelaide $PR_1 = +6m.28s.$, $SR_1 = +10m.3s.$ Batavia records an M at
 +21.2m. Colombo M = +62.7m. Victoria S = +40m.10s., eL =
 +65.2m. Toronto L = +74.8m. Ottawa e? = +41m.10s., eN? =
 +61m.10s., L = +75.2m. Harvard gives two complete sets of records,
 and says that they refer to a shock in the Sandwich Islands. Zagreb
 $iNW = +20m.52s.$, $MNW = +120.2m.$ San Fernando MN = +95.7m.
 De Bilt $eE = +46m.16s.$, and +52m.46s., $mE = -53m.8s.$ Epicentre $52^\circ 0'N.$
 $164^\circ 0'E.$ Eskdalemuir gives four other i's.

Nov. 3d. Records also at 3h. (Helwan), 7h. (Tokyo), 12h. (Manila (2) and Batavia), 17h. (Zagreb), 18h. (Melbourne and Riverview), 19h. (Riverview), 21h. (Melbourne, Sydney, and Riverview), 23h. (Helwan).

Nov. 4d. Records at 2h. (Riverview), 3h. (Helwan), 6h. (Helwan), 7h. (Paris), 11h. (Tacubaya), 13h. (Helwan, Taihoku, and Paris), 18h. (Harvard), 21h. (Zagreb).

Nov. 5d. 22h. 39m. 0s. Epicentre $12^\circ 0'N. 95^\circ 5'W.$ (as on 1918 Jan 25d.).

A = -0.94, B = -0.74, C = +0.208; D = -0.995, E = +0.096;
 G = -0.020, H = -0.207, K = -0.978.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	E.	16.0	99	3 16	-36	—	—	5.3	5.9
	N.	16.0	99	3 18	-34	—	—	5.3	6.0
Washington		31.5	28	6 48	+ 5	11 58	- 2	17.3	—
Toronto		34.5	21	—	—	—	—	19.5	23.5
Harvard		37.1	30	7 27	- 4	—	—	e 19.9	23.6
Ottawa		37.4	23	i 9 29	+116	—	—	e 20.0	—
La Paz		39.3	136	7 58	+ 9	14 0	+ 4	19.0	21.3
Edinburgh		81.4	34	38 0	? L	—	—	(38.0)	49.5
Eskdalemuir		81.5	34	—	—	—	—	38.0	—
San Fernando		82.4	54	33 30	? L	—	—	(33.5)	—
Kew		83.9	39	—	—	—	—	—	51.0
De Bilt		87.0	37	—	—	—	—	e 40.0	46.0
Helwan		113.9	49	64 0	? L	—	—	(64.0)	—

Additional records: Toronto gives $iL = +21.8m.$ Harvard $LN = +21.0m.$
 La Paz $T_0 = 22h.39m.20s.$ De Bilt $MN = +46.5m.$

Nov. 5d. Records also at 0h. (Adelaide and Riverview), 1h. (Riverview and Manila), 3h. (San Fernando), 5h. (Riverview, Manila, and Apia), 8h. (Helwan), 10h. (Riverview), 13h. (Athens (3)), 16h. (Batavia).

Nov. 6d. 19h. 26m. 0s. Epicentre $44^{\circ}6'N$, $13^{\circ}3'E$.

A = +.693, B = +.164, C = +.702; D = +.230, E = -.973;

G = +.683, H = +.162, K = -.712.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Zagreb	2.2	69	e 0 43	+ 9	i 1 11	+11	—	1.4
Graz	2.9	33	i 0 52	+ 7	—	—	—	—
Rocca di Papa	2.9	189	e 1 2	+17	(2 2)	?L	(2.0)	3.2
Monte Cassino	2.9	170	1 36	?L	—	—	(1.6)	3.9
Milan	3.0	286	1 46	?L	—	—	(1.8)	2.9
Moncalieri	4.0	276	1 29	+27	2 5	+15	2.5	2.9
Zurich	4.3	312	1 3	- 4	i 1 56	- 2	—	2.0
Budapest	4.9	52	1 28	+12	—	—	—	—
Hohenheim	5.0	328	i 1 6	-11	—	—	—	—
Neuchâtel	5.1	300	1 16	- 3	2 30	+10	—	—
Besancon	5.7	300	1 28	0	2 51	?L	(2.9)	—
Paris	8.5	304	e 2 47	+38	e 3 49	- 1	4.3	5.0
Uccle	8.7	319	e 2 0	-12	e 3 48	- 8	—	—
De Bilt	9.3	327	e 2 20	0	e 3 44	-26	4.5	5.3
Tortosa	10.1	253	5 24	?L	—	—	6.5	7.5
Shide	11.6	307	6 1	?L	—	—	(6.0)	—

Additional records: Zagreb gives $iP = +0m.46s.$, $i = +55s.$ and $+1m.12s.$, $MNW = +1.3m.$ Rocca di Papa. The record taken for S is given as another P, $SN = +1m.42s.$, and SN is taken for L, $MN = +3.5m.$ Zurich $iPN = +1m.10s.$, iPE and $V = +1m.11s.$, $MN = +2.3m.$ Neuchâtel $P = +1m.30s.$ De Bilt $MN = +4.6m.$

Nov. 6d. Records also at 1h. (La Paz), 3h. (Helwan), 19h. (Mizusawa), 20h. (Zagreb), 21h. (Riverview), 22h. (Batavia, Manila, Rocca di Papa, and Zagreb).

Nov. 7d. Records at 1h. (Manila), 9h. (Vieques), 13h. (Barcelona), 16h. (Lick), 17h. (Manila (2)), 18h. and 19h. (La Paz), 20h. (Manila), 21h. (Mizusawa and Tokyo).

1918. Nov. 8d. 4h. 38m. 0s. Epicentre $44^{\circ}9'N$, $151^{\circ}4'E$.

A = -.622, B = +.339, C = +.706; D = +.479, E = +.878;

G = -.620, H = +.338, K = -.708.

Direct comparison with Sept. 8d. 5h. 40m. 30s., epicentre $46^{\circ}5'N$, $151^{\circ}4'E$, shows systematic differences. Hence the above solution, quite independently computed, is allowed to stand.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ootomari	O.	6.3	289	2 45	?S	(2 45)	- 7	3.2	—
Mizusawa	O.	9.6	236	2 21	- 3	4 17	- 1	—	—
Tokyo	O.	12.5	228	3 10	0	4 37	-62	5.3	—
Osaka	O.	15.9	235	3 55	- 4	—	—	7.6	—
Kobe	O.	16.1	236	i 4 0	+ 7	—	—	7.4	10.9
Zi-ka-wei	—	27.1	250	5 54	- 5	e 10 38	- 5	—	—
Taihoku	O.	31.2	241	6 25	-15	9 11	-163	11.5	—
Manila	W.	39.7	231	7 38	-14	14 0	- 2	20.0	21.2
Sitka	B.O.	45.3	47	8 22	-13	—	—	e 22.5	27.8
Honolulu	M.	47.5	102	7 36	-75	15 0	-48	e 24.8	27.0
Caleutta	E. O.E.	55.5	271	9 48	+ 5	17 42	+14	23.0	34.3
Victoria	M.	55.5	52	9 25	-18	15 22	-126	25.8	42.5
	Z.	55.5	52	9 0	-43	15 45	-103	26.7	44.1
Simla	O.E.	58.0	284	9 30	-29	17 36	-23	27.2	29.9
Berkeley	N.	62.0	62	e 10 24	- 1	e 18 42?	- 6	e 25.9	29.5
	E.	62.0	62	e 10 23	- 2	e 18 50	+ 2	e 25.6	29.7
	Z.	62.0	62	e 10 20	- 5	—	—	—	—
Saskatoon	Ma.	62.7	41	11 22	+52	19 56	+59	28.0?	—
Lick	N. W.	63.0	62	e 10 31	- 1	e 19 7	+ 6	—	31.3
	E. W.	63.0	62	e 10 34	+ 2	e 19 2	+ 1	—	31.4
	Z. W.	63.0	62	e 10 24	- 8	—	—	—	—
Batavia	W.	64.8	231	10 44	0	19 36	+13	e 29.0	50.0

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°		M. S.	S.	M. S.	S.	M.	M.
Apia	W.	67.5	140	11 5	-4	i 20 6	+10	i 27.5?	36.0
Bombay	O.E.	68.9	277	11 11	-1				38.2
Kodaikanal	M.	71.5	269	12 0	-33	(21 6	+22	21.1	50.8
Colombo	M.	72.2	265	10 18	-73	20 0	-52	42.0	59.6
Tucson	N. B.O.	72.8	60	11 34	-1	21 11	+11	35.4	36.1
	E. B.O.	72.8	60	11 34	-1	21 10	+10	37.0	44.2
Lemberg	B.O.	74.8	329	e 11 54	+6	i 21 33	+9	e 38.3	49.3
Edinburgh	M.	77.0	347	12 0	-1				62.0
Lawrence	E. W.	77.0	47	i 11 56	-5	21 49	0	31.1	44.7
	N. W.	77.0	47	i 11 57	-4	22 6	+17	31.2	49.7
Eskdalemuir	G.	77.5	347	(12 4)	0	12 4	? P		
Sydney	M.	78.7	180	13 0	+49	22 12	+4	33.6	43.5
De Bilt		78.8	340	12 17	+5	22 16	+6	e 36.0	37.1
Riverview		78.8	180	i 12 9	-3	i 22 2	-8	e 32.7	33.3
Bidston	M.S.	79.3	346	12 24	-7	22 12	-3		49.0
Ann Arbor	E. B.	79.9	39	11 18	-60	21 0	-82	37.8	43.3
	N. B.	79.9	39	11 12	-66	21 0	-82	37.0	51.5
St. Louis	N. W.	79.9	45	12 12	-6	22 18	-4	38.2	43.2
West Bromwich	M.S.	80.0	345	12 16	-3	22 26	+3		
Uccle		80.1	340	i 12 26	+6	22 30	+6	38.0	52.8
Ottawa		80.5	30	i 12 20	-2	e 21 49	-40	e 36.5	
Oxford	M.S.	80.5	345	12 30	+8	22 35	+6		
Kew	M.	80.6	344	12 0	-23				22.0
Toronto	M.	80.6	34	e 12 48	+25	e 22 36	+6	i 36.4	51.0
Adelaide	M.	80.7	191	13 17	+54	21 52	-39	33.7	38.9
Zagreb	W.	81.1	330	i 12 27	+1	i 22 39	+3	46.5	
Shide	M.S.	81.5	344	12 36	-8	22 46	-5	36.8	56.5
Cork	M.	81.7	349			22 0	-43	42.5	47.5
Zurich		82.1	335	i 12 37	+6	i 22 53	-7		
Paris		82.4	340	i 12 36	-4	i 22 55	+5	37.0	41.0
Northfield	B.O.	82.7	29	12 32	-2	22 57	+3	42.5	
Pola	W.	82.7	331	e 12 30	-4	e 22 30	-24	e 39.5	49.9
Ithaca	E. B.O.	82.8	33	12 45	+10	23 14	+19	38.1	50.2
	N. B.O.	82.8	33	12 46	+11	23 6	+11	38.6	
Melbourne	M.	82.9	186	12 18	-17	22 54	-2	38.8	55.5
Milan		83.6	334	12 47	+7	23 7	+2	41.0	24.2?
Moncalieri	S.	84.5	335	12 44	-1	i 23 14	0	29.9	50.9
Athens		84.8	321	i 12 50	+3	23 19	+2	29.3	43.9
Harvard	N. B.O.	84.8	30	12 21	-26	22 48	-29	e 38.0	
	E. B.O.	84.8	30	13 8	+21	22 19	-58	e 38.0	40.9
Halifax	Ma.	85.3	24	13 8	+18	23 37	+15	36.5?	
Georgetown	N.	85.5	36	12 47	-4	23 25	0	e 39.3	51.2
	E.	85.5	36	12 47	-4	23 34	+9	e 39.0	51.5
	Z.	85.5	36	12 41	-10			e 39.4	
Washington	Mar.	85.5	36	12 40	-11	23 12	-13	42.0	
Cheltenham	N. B.O.	85.7	36	13 0	+8	23 37	+10	41.2	62.8
Monte Cassino	Ag.	85.7	330	12 41	-11				13.6
Rocca di Papa	Ag.	85.9	330	12 42	-11	23 11	-18	41.4	54.8
Marseilles	Ma.	86.8	337	12 56	-2	i 23 42	+3	43.0	56.0
Helwan	M.	87.5	311	13 0	-2				61.7
Tacubaya		89.3	63	12 24	-48				45.1
Barcelona		89.4	338	i 13 5	-7	i 23 40	-27	39.4	48.1
Tortosa		90.4	339	13 11	-7	23 48	-30	39.6	54.0
Coimbra		93.0	346	13 26	-6	23 55	-50	41.1	50.3
Algiers	B.M.	93.5	334	13 15	-20	24 0	-51	47.0	60.2
Rio Tinto	M.	95.0	343	14 0	-17				62.0
San Fernando		96.2	342	13 42	-8	25 30	+12	49.2	63.0
Vieques	N.	108.6	38	18 58	? PR ₁	34 34	? SR ₁	57.4	68.8
	E.	108.6	38	19 0	? PR ₁	34 37	? SR ₁	57.5	58.1
Balboa Heights	B.O.	109.4	52	19 0	? PR ₁				
La Paz	Bi.	136.4	60	i 19 34	[+1]	33 28	?	58.7	67.5
Cape Town	M.	142.6	272	11 6	?	20 0	[+16]	67.6	81.4
Andalgala	N.	145.4	70	19 0	[-49]				86.8
	E.	145.4	70	18 48	[-61]			69.1	82.8
Pilar	E.	149.6	74	20 18	[-23]			76.6	124.3
	N.	149.6	74	20 24	[+29]			76.7	110.8
Cipolletti	M.	150.3	92	17 54	+2			68.8	92.7
Chacarita	M.	155.0	76	24 12	? PR ₁				30.9

For Notes see next page.

NOTES TO NOV. 8d. 4h. 38m. 0s.

Additional records : Mizusawa gives SN = +4m.15s. Osaka MN = +9.3m.
 Kobe MN = +8.7m. Manila iN = +9m.48s., iE = +10m.6s., MN =
 +20.2m., T₀ = 4h.37m.35s. Sitka MN = +27.4m. Berkeley T₀ =
 4h.37m.51s. Saskatoon T₀ = 4h.38m.49s. Lick T₀ = 4h.37m.47s.
 Batavia M = +21.0m., e = +34m.24s., M = +41.0m., T₀ = 4h.37m.52s.
 Apia i = +14m.0s. Lemberg eSR₁ = +26m.54s., +29m.48s., and
 +31m.48s. Eskdalemuir P = +6m.42s. Sydney SR₁ = +27m.48s.
 De Bilt SR₁ = +27m.48s., m = +28m.34s., T₀ = 4h.38m.16s. Riverview
 eP = +12m.2s., iP = +13m.16s., PS = +22m.51s., and +23m.16s., SR₁ =
 +26m.15s., SR₂ = +27m.23s., MN = +33.8m., T₀ = 4h.37m.59s. St.
 Louis LN = +37.2m., MN = +47.1m., T₀ = 4h.38m.4s. Uccle eP =
 +12m.13s., iSR₁ = +28m.17s., MN = +46.8m., MZ = +56.7m., T₀ =
 4h.38m.6s. Ottawa ePR₁ = +15m.25s., eSR₁ = +27m.54s., L = +47.0m.,
 T₀ = 4h.38m.50s. Toronto iP = +16m.0s., iS = +27m.54s., iL = +33.0m.
 and +46.6m. Adelaide PR₁ = +15m.2s., SR₁ = +25m.47s. Zagreb
 eP = +12m.22s., i = +12m.32s., i = +22m.41s. Zurich eP = +12m.24s.,
 T₀ = 4h.37m.54s. Paris eP = +12m.27s., T₀ = 4h.37m.57s. Pola MN =
 +53.6m., T₀ = 4h.37m.30s. Ithaca PR₁ = +16m.8s., T₀ = 4h.38m.22s.
 Melbourne PR₁ = +15m.6s., PR₂ = +17m.12s., SR₁ = +28m.12s., SR₂ =
 +31m.42s. Moncalieri iP = +12m.51s., MN = +54.8m., T₀ = 4h.38m.12s.
 Athens eP = +12m.42s., LN = +29.4m., MN = +56.4m., T₀ = 4h.38m.2s.
 Harvard iE = +23m.41s., eE = +24m.50s., eE = +25m.19s., T₀ = 4h.38m.21s.
 Halifax T₀ = 4h.38m.36s. Georgetown iZ = +13m.3s., T₀ = 4h.38m.7s.
 Cheltenham LE = +45.7m., ME = 54.6m., T₀ = 4h.38m.20s. Rocca di
 Papa eL = +30.0m., MN = +59.9m. Barcelona L = +29.5m., MN =
 +45.4m., T₀ = 4h.38m.28s. Coimbra PR₁ = +17m.19s., iN = +25m.49s.
 and +26m.7s., LN = +45.7m., MN = +47.9m., T₀ = 4h.38m.53s. San
 Fernando MN = +65.2m., T₀ = 4h.37m.45s. La Paz eP = +19m.30s.,
 PR₁N = +22m.18s., PR₁E = +22m.25s. or +25m.35s., LN = +58.6m.

Nov. 8d. Records also at 2h. (Mizusawa), 5h. and 7h. (Batavia), 12h. (Tokyo),
 14h. (De Bilt), 16h. (Tokyo), 17h. (Algiers).

Nov. 9d. Records at 0h. (Washington and Ottawa), 3h. (San Fernando), 4h.
 (Dehra Dun), 5h. (Tokyo), 19h. and 20h. (Manila), 23h. (La Paz, San
 Fernando, and Rocca di Papa).

Nov. 10d. 15h. 11m. 40s. Epicentre 45°-0N. 11°-5E.

$$A = +.693, B = +.141, C = +.707; \quad D = +.199, E = -.980; \\ G = +.693, H = +.141, K = -.707.$$

The epicentre is apparently not the same as on November 6d. The residuals
 are not satisfactory, being chiefly positive; but it does not seem possible
 to alter T₀ or the epicentre without introducing other unsatisfactory features.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Pola	1.7	95	—	—	—	—	e 0.6	1.8
Milan	1.7	286	0 56	+30	1 31?	+43	—	—
Moncalieri	2.7	271	1 16	+34	1 58	?L	(2.0)	2.6
Zurich	e. 3.1	322	e 1 21	+32	i 2 36	?L	(2.6)	3.5
	z. 3.1	322	1 21	+32	i 2 30	?L	(2.5)	3.0
Zagreb	3.3	74	e 1 9	+17	i 2 0	+29	—	2.6
Rocca di Papa	3.4	164	i 0 48	- 5	1 28	- 6	—	1.7
Graz	3.5	52	1 16	+21	2 37	?L	(2.6)	—
Monte Cassino	3.9	146	1 3	+ 2	—	—	—	2.3
Hohenheim	4.1	339	1 33	+29	2 50	?L	(2.8)	—
Besancon	4.4	303	1 32	+24	3 12	?L	(3.2)	—
Marseilles	4.7	251	i 1 34	+21	i 2 42	+33	—	3.2
Pompei	4.8	151	1 25	+11	2 11	0	—	3.5
Budapest	5.8	62	3 20	?L	—	—	(3.3)	—
Paris	7.2	306	e 1 20	-29	e 2 46	-29	3.3	5.3
Uccle	7.5	323	2 19	+25	—	—	e 4.7	—
Barcelona	7.7	246	e 2 56	-59	—	—	e 3.2	6.2
De Bilt	8.2	332	3 5	+61	—	—	5.2	5.8
Tortosa	9.0	247	2 15	- 1	4 11	+ 8	4.6	6.5
Kew	10.1	314	—	—	—	—	—	8.3
Shide	10.3	308	—	—	—	—	5.7	—
Algiers	10.4	221	e 2 36	0	4 40	0	5.8	—

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	11.6	123	e 3 3	+10	4 44	-25	i 5.8	6.5
Bidston	12.7	317	—	—	—	—	—	9.8
Eskdalemuir	13.9	323	—	—	—	—	7.3	—
Edinburgh	14.3	325	8 20	?L	—	—	(8.3)	11.3
Rio Tinto	15.4	248	8 20	?L	—	—	(8.3)	12.3
Coimbra	15.4	258	3 57	+13	6 51	+10	9.3	9.9
San Fernando	15.9	244	5 50	+119	(7 20)	+27	—	10.3
Helwan	21.7	127	9 20	?S	(9 20)	+21	—	—
Ottawa	58.2	304	—	—	—	—	e 35.3	—

Additional records : Moncalieri gives M = +2.8m. Zagreb ePNW = +1m.11s.,
 iPNE = +1m.17s., i = -1m.41s. Rocca di Papa iP = +0m.52s., ME =
 +1.8m. Barcelona MN = +8.1m. Athens iE = +5m.27s., iN =
 +5m.54s., MN = +7.5m. Bidston P = 15h.0m.12s. Coimbra MN =
 +9.7m. San Fernando MN = +10.1m.

Nov. 10d. 17h. 58m. 3s. Epicentre 34°·6N. 140°·7E.

A = -637, B = +521, C = +568.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	1.3	324	0 46	+26	1 11	+35	—	—
Osaka	4.3	272	1 5	-2	—	—	1.9	2.9
Mizusawa	4.5	358	1 10	0	2 4	0	—	—
Kobe	4.6	272	e 1 21	+10	—	—	—	—
Nagasaki	9.2	263	4 13	?S	(4 8)	-0	—	—
Zi-ka-wei	16.5	264	e 3 51	-8	e 8 13	?L	(e 8.2)	—
Taihoku	19.2	245	—	—	11 50	?L	(11.8)	—
Kodaikanal	62.3	263	28 21	?L	—	—	(28.4)	—
La Paz	148.5	62	[20 6]	[+12]	—	—	—	—

Osaka gives MN = +2.8m., and Mizusawa SN = +2m.7s.

Nov. 10d. Records also at 8h. (Helwan). 9h. (Nagasaki and Zi-ka-wei), 13h. (Ottawa, Tacubaya, and Saskatoon), 16h. (Zi-ka-wei, Rocca di Papa, Zagreb, Manila, Colombo, Hokoto, and Taihoku), 17h. (Zagreb (2), Rocca di Papa, Kodaikanal, and Kobe), 18h. (Osaka, Hokoto, Mizusawa, Kodaikanal, Tokyo, Zi-ka-wei, and Taihoku), 19h. (Taihoku, Nagasaki, Zi-ka-wei, Rocca di Papa, and Zagreb), 20h. (Athens), 23h. (Helwan).

Nov. 11d. 7h. 3m. 0s. Epicentre 36°·1N. 137°·3E. (as on 1917 Feb. 21d. 15h.).

A = -594, B = +548, C = +589; D = +678, E = +735;

G = -433, H = +400, K = -808.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	2.0	100	0 41	+10	1 8	+13	—	—
Osaka	2.1	218	—	—	0 54	-4	1.7	2.1
Kobe	2.3	231	—	—	1 4	+1	1.8	1.9
Mizusawa	4.3	45	1 10	+3	2 6	+8	—	—
	4.3	45	1 11	+4	2 1	+3	—	—
Ootomari	11.3	19	2 53	-4	—	—	5.4	8.7
Zi-ka-wei	14.1	254	3 40	+13	e 6 40	+30	—	9.8
Manila	26.0	218	e 6 14	+26	e 10 12	-10	12.0	13.1
Bombay	58.7	272	—	—	—	—	—	39.6
Kodaikanal	59.8	262	41 18	?	—	—	—	—
Colombo	59.9	259	39 0	?L	—	—	(39.0)	—
Graz	81.9	325	e 13 0	+30	—	—	—	—
Edinburgh	82.1	339	44 0	?L	—	—	(44.0)	58.0
De Bilt	82.5	332	—	—	—	—	e 41.0	45.8
Eskdalemuir	82.6	339	—	—	—	—	44.0	—
Zagreb	82.6	322	—	—	—	—	42.0	53.0
Kew	84.9	336	—	—	—	—	—	53.0
Moncalieri	87.0	327	e 41 10	?	45 15	?	47.5	57.0
Rocca di Papa	87.2	321	e 12 4	-56	e 17 4	?PR ₁	e 49.1	—
Barcelona	92.3	327	—	—	—	—	e 51.5	56.8
Ottawa	93.2	22	—	—	—	—	e 61.0	—
Toronto	93.5	25	—	—	—	—	54.4	—
Coimbra	97.5	333	e 46 0	?	—	—	54.4	—
Rio Tinto	98.9	331	55 0	?L	—	—	(55.0)	60.0
San Fernando	100.0	330	24 0	?S	(24 0)	-116	(55.0)	60.0
La Paz	150.1	56	20 9	[+13]	—	—	—	—

Additional records : Osaka gives MN = +1.9m. Kobe MN = +2.0m.
 Zi-ka-wei MN = +9.7m. Manila MN = +13.4m. Zagreb MNW =
 +48.0m. Paris (C = -86°·1) records 7h.5m. to 8h. Moncalieri
 probably records a different shock. Toronto L = +59.8m. San
 Fernando MN = +65.0m.

Nov. 11d. Records also at 2h. (Zagreb (3), Rocca di Papa (3), Zi-ka-wei, Tokyo, and Taihoku), 3h. (Zagreb and Rocca di Papa), 4h. (Zagreb, Rocca di Papa, Taihoku, Hokoto, and Manila), 11h. (Rocca di Papa and Zagreb), 13h. (Manila, Zi-ka-wei, Nagasaki, Tokyo, Mizusawa, and Osaka), 15h. (Mizusawa, Tokyo, Osaka, and Taihoku), 21h. (Manila).

Nov. 12d. 12h. 1m. 35s. Epicentre $18^{\circ}5'N$. $68^{\circ}8'W$.

$$A = +.343, B = -.884, C = +.317.$$

Possibly the epicentre is the same as at 21h., but the solution was made independently.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Vieques	N.	3.2	98	0 52	+ 2	—	—	1.3	1.5
	E.	3.2	98	0 49	- 1	—	—	1.2	1.5
Port au Prince		3.3	271	e 0 52	0	1 32	+ 1	1.8	2.2
La Paz		35.0	180	e 7 12	- 1	—	—	22.1	24.0
De Bilt		65.7	40	—	—	—	—	34.4	36.4

De Bilt gives $eLN = +28.4m$.

1918. Nov. 12d. 21h. 44m. 32s. Epicentre $18^{\circ}2'N$. $68^{\circ}2'W$.

$$A = +.353, B = -.882, C = +.312; \quad D = -.929, E = -.371;$$

$$G = +.116, H = -.290, K = -.950.$$

The residuals would be improved by increasing T_0 by a few seconds—say 6sec.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		°	°	M. S.	S.	M. S.	S.	M.	M.
Vieques	N.	B.O.	2.6 89	0 41	0	—	—	1.0	1.5
	E.	B.O.	2.6 89	0 43	+ 2	—	—	1.0	1.5
Port au Prince		B.O.	3.9 276	i 0 47	-14	1 5	-42	1.8	2.3
Balboa Hts.	E.	B.O.	14.4 232	3 30	- 2	—	—	6.5	7.0
	N.	B.O.	14.4 232	3 34	+ 2	—	—	6.8	6.7
Cheltenham	N.	B.O.	21.9 342	5 5	+ 1	9 10	+ 7	11.2	15.3
Georgetown	N.	—	22.1 341	i 5 15	+ 9	i 9 20	+13	e 11.3	—
Washington	Mar.	22.1 341	5 11	+ 5	9 16	+ 9	—	11.1	—
Harvard	N.	B.O.	24.3 355	i 5 8	-23	9 27	-23	e 11.2	—
	E.	B.O.	24.3 355	—	—	9 37	-13	e 11.0	13.4
Ithaca	N.	B.O.	25.3 345	e 5 41	0	10 9	0	12.2	—
	E.	B.O.	25.3 345	e 5 43	+ 2	10 7	- 2	11.9	—
Northfield		B.O.	26.2 353	6 8	+16	10 10	-13	13.5	—
Toronto	M.	27.1 342	6 22	+23	11 4	+21	—	13.3	20.7
Ann Arbor	E.	M.	27.5 335	6 22	+19	10 46	- 4	13.2	18.5
	N.	B.	27.5 335	6 28	+25	10 46	- 4	13.1	—
Ottawa			27.9 349	e 6 13	+ 6	e 10 47	-10	e 13.5	—
St. Louis	W.	28.0 321	e 6 10	+ 2	11 16	+17	—	13.8	—
Lawrence	N.	W.	31.4 317	6 37	- 5	—	—	16.0	—
	E.	W.	31.4 317	6 40	- 2	—	—	18.4	22.2
La Paz	Bi.	34.7 179	i 7 8	- 3	i 12 36	-15	—	19.7	22.5
La Quiaca	E.	M.	40.4 177	5 28	-150	(13 52)	-21	13.9	33.3
	N.	M.	40.4 177	5 52	-126	(13 58)	-15	14.0	23.3
Tucson	E.	B.O.	40.8 299	9 48	? PR ₁	—	—	28.1	30.6
Andalgala	E.	M.	45.8 178	—	—	—	—	28.3	30.1
	N.	M.	45.8 178	—	—	—	—	28.8	32.0
Pilar	E.	M.	50.0 175	—	—	—	—	31.1	36.9
Berkeley			50.8 304	e 10 33	+81	—	—	—	—
Chacarita	M.	53.6 170	—	—	—	—	—	33.6	34.6
Victoria	M.	53.6 317	9 42	+12	17 36	+32	—	28.3	35.9
Rio Tinto	M.	56.7 54	16 28	? S	(16 28)	-74	—	—	37.5
San Fernando		57.1 56	17 16	? S	(17 16)	-31	—	31.0	35.0
Eskdalemuir	G.	60.9 35	10 21	+ 3	18 27	- 8	—	—	33.2
Edinburgh	M.	61.1 35	9 48	-32	—	—	—	—	39.5

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.		O-C.	S.	O-C.	L.	M.
		°	°	M.	S.	S.	M. S.	S.	M.	M.
Shide	M.S.	61.5	41	18	41	? S.	(18 41)	- 1	—	36.5
Kew	M.	62.2	40	—	—	—	—	—	—	41.5
Tortosa	—	62.3	53	10	36	+ 9	18 55	+ 3	26.2	33.0
Barcelona	—	63.5	50	e 10	49	+14	19 8?	+ 1	26.0	32.8
Algiers	B.M.	64.5	57	e 10	40	- 2	19 14	- 5	26.5	32.5
Uccle	—	65.0	40	e 10	45	0	e 20 16	+51	e 26.5	37.5
De Bilt	B.	65.6	39	10	52	+ 3	19 31	- 1	e 30.5	35.5
	N.	65.6	39	—	—	—	—	—	e 28.5	32.3
Moncalieri	S.	67.4	46	11	2	+ 2	i 19 56	+ 1	34.8	43.6
Zurich	—	67.9	44	e 11	6	+ 3	—	—	—	—
Hohenheim	B.O.	68.3	42	e 10	41	-25	—	—	—	—
Rocca di Papa	Ag.	71.4	49	e 11	24	- 2	—	—	—	11.9
Pompeii	O.A.	72.8	50	11	50	+15	21 24	+24	35.6	40.6
Zagreb	W.	73.1	44	e 11	40	+ 3	e 20 58	- 5	38.5	46.5
Honolulu	M.	83.4	290	e 13	58	-80	—	—	41.3	51.8
Helwan	M.	88.9	58	13	28	+18	—	—	—	59.7
Zi-ka-wei	—	129.8	349	e 22	45	? PR ₁	—	—	—	—
Kodaikanal	M.	135.7	53	83	46	? L.	—	—	(83.8)	—
Riverview	—	141.6	239	—	—	—	e 35 18	+245	e 72.8	78.0
Manila	W.	146.0	345	e 20	6	[+16]	—	—	—	—

Additional records : Port au Prince gives SNE = +52s. Cheltenham PE = +5m.4s., T_0 = 21h.44m.30s. Georgetown is E = -9m.28s. Harvard iPR₁ = +5m.20s., ePRE = +5m.37s., T_0 = 21h.44m.24s. Toronto L = +15.5m. and eL = +16.6m., T_0 = 21h.45m.0s. Ottawa L = +20.5m., and +37.5m., T_0 = 21h.45m.0s. La Paz P = +7m.5s., T_0 = 21h.44m.39s. Pilar MN = +34.9m. San Fernando MN = 34.0m. De Bilt i = +11m.7s., eSR₁E = +23m.46s., T_0 = 21h.44m.46s. Zagreb MNW = +44.5m.

Nov. 12d. Records also at 0h. (San Fernando), 3h. (Helwan), 4h. (Tokyo), 5h. (Helwan), 11h. (Zurich, Rocca di Papa, Zagreb, Pompeii, and La Paz), 13h. (Zagreb (2), Rocca di Papa (2), Zurich, Tokyo, and Osaka), 15h. (Tokyo), 18h. (Osaka and Tokyo), 19h. (Bidston and Zagreb), 22h. (Melbourne), 23h. (La Paz).

Nov. 13d. 10h. 13m. 27s. Epicentre 37° 5N. 27° 5E.

A = +.704, B = +.366, C = +.609; D = +.462, E = -.887;
G = +.540, H = +.281, K = -.793.

In some ways 39° 0N. 27° 0E., the epicentre of 1918 June 13d. and 19d., would suit the observations better.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3.0	27.8	e 0 47	0	e 1 23	0	i 1.7	2.0
Pompeii	10.5	294	2 39	+ 2	5 9	? L	13.6	—
Budapest	11.7	331	3 33	+38	—	—	—	—
Zagreb	11.9	318	e 3 15	+17	5 24	+ 7	—	6.6
Rocca di Papa	12.1	295	e 2 45	-15	6 12	? L	e 8.6	3.8
Lemberg	12.6	350	—	—	—	—	e 6.8	7.6
Moncalieri	16.6	303	e 4 29	+29	7 9	0	9.7	—
Uccle	21.1	316	—	—	—	—	e 11.2	11.6
Paris	21.3	310	—	—	e 8 38	-12	11.6	15.6
De Bilt	21.4	320	—	—	e 8 28	-25	e 10.4	11.7
Bidston	26.4	318	1 15	? L	8 21	-129	—	20.0
Edinburgh	27.5	322	15 3	—	—	—	(15.0)	—

Additional records : Zagreb gives MNW = +7.0m. Rocca di Papa M₂ = +8.0m. Eskdalemuir (Δ = 27° 3) records +9m.33s. to +30m.33s.

Nov. 13d. Records also at 0h. (San Fernando), 2h. (Tokyo (2)), 2h., 6h., and 9h. (Helwan), 20h. (Zurich), 21h. (Riverview and Melbourne), 22h. (San Fernando).

Nov. 14d. 12h. 52m. 35s. Epicentre $1^{\circ}38'. 143^{\circ}4'E$. (as on 1918 July 29d. 16h.).

$$A = -.803, B = +.596, C = -.023; \quad D = +.596, E = +.803; \\ G = +.018, H = -.014, K = -1.000.$$

Probably the Adelaide records are 10 minutes in error; but the solution is unsatisfactory because it leaves unexplained the absence of Japanese and Indian observations, and the European records are too large. If we put the epicentre south of Australia (say at $66^{\circ}08'. 145^{\circ}0'E$) the La Paz observation cannot be explained, though the European records are then in better accord.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	33.3	168	e 7 14	+ 2	e 12 92	-20	e 16.7	20.8
Sydney	33.3	168	11 37	?S	(11 37)	-52	18.9	20.8
Adelaide	33.9	187	17 10	?	21 50	?	25.9	29.1
Melbourne	36.5	178	—	—	—	—	22.8	24.7
Helwan	109.8	301	51 25	?L	—	—	(51.4)	—
De Bilt	E. 118.5	332	—	—	—	—	e 88.4	e 91.6
	N. 118.5	332	—	—	—	—	e 89.4	98.4
Edinburgh	119.1	340	70 25	?L	—	—	(70.4)	—
Bidston	121.0	337	—	—	—	—	—	(107.4)
Kew	121.3	334	—	—	—	—	—	(112.4)
La Paz	144.1	122	19 44	[- 3]	—	—	—	—

Additional records: Riverview gives +12m.38s. and MN = -19.1m. Adelaide $PR_1 = +19m.0s.$, $SR_1 = +23m.35s.$ Eskdalemuir ($\Delta = 119^{\circ}.6$) records 14h.14m. to 15h.0m.

Nov. 14d. 16h. 6m. 50s. Epicentre $47^{\circ}0'N. 158^{\circ}0'E$.

$$A = -.632, B = +.256, C = +.731; \quad D = +.375, E = +.927. \\ G = -.678, H = +.274, K = -.682.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Osaka	20.8	242	4 46	- 5	—	—	—	11.3
Honolulu	43.7	111	e 15 16	?S	(e 15 16)	+18	26.5	30.2
Edinburgh	75.9	351	37 10	?L	—	—	(37.2)	65.7
Eskdalemuir	76.4	351	21 43	?S	(21 43)	+ 1	35.2	—
De Bilt	78.2	345	—	—	e 21 58	- 4	41.2	42.4
Uccle	79.6	345	—	—	—	—	—	48.2
Zagreb	81.3	334	—	—	—	—	39.2	—
Paris	81.8	346	—	—	—	—	e 47.2	54.2
Rocca di Papa	86.0	337	e 36 22	?	—	—	—	59.4
Barcelona	89.0	342	—	—	—	—	e 47.0	55.0
Helwan	89.3	317	50 10	?L	—	—	(50.2)	—

Additional records: Osaka MN = +11.8m. De Bilt eSR₁N = +27m.33s. Paris MN = +57.2m.

Nov. 14d. Records also at 0h. (Port au Prince), 2h. (Helwan), 8h. (Helwan and La Paz), 10h. (Riverview), 18h. (Helwan), 21h. (San Fernando).

Nov. 15d. Records at 1h. (De Bilt), 3h. and 9h. (Helwan), 12h. (De Bilt), 15h. (Melbourne and Riverview), 16h. (De Bilt and Ootomari), 18h. (De Bilt).

Nov. 16d. 5h. 56m. 30s. Epicentre $12^{\circ}0'N. 95^{\circ}5'W$. (as on 1918 Nov. 5d.).

$$A = -.094, B = -.974, C = +.208; \quad D = -.995, E = +.096; \\ G = -.020, H = -.207, K = -.978.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tucson	E. 24.7	328	9 39	?S	(9 39)	-18	14.8	15.7
Toronto	34.5	21	—	—	—	—	18.3	—
Ottawa	37.4	23	—	—	—	—	e 18.5	—
La Paz	39.3	136	8 19	+30	—	—	26.9	32.0
Victoria	43.2	333	17 34	?SR ₁	—	—	22.5	24.0
Eskdalemuir	81.4	34	38 30	?L	—	—	(38.5)	—
Uccle	86.8	39	e 13 0	+ 2	—	—	—	—
De Bilt	87.0	37	—	—	e 23 33	- 8	e 40.5	49.7

Additional records: Tucson gives SE = +12m.42s. (=LE?), SN = +12m.40s. (=LN?), MN = +15.2m. De Bilt eLN = +42.5m.

Nov. 16d. Records also at 4h. (San Fernando), 5h. (Mizusawa), 16h. (San Fernando), 17h. (De Bilt and Tacubaya), 19h. (Taihoku and Zi-ka-wei), 21h. (Mizusawa and Tokyo), 22h. (De Bilt), 23h. (De Bilt (2)).

Nov. 17d. Records at 9h. and 16h. (La Paz), 20h. (Mizusawa (2)), 22h. (St. Louis and La Paz), 23h. (Edinburgh).

1918. Nov. 18d. 18h. 41m. 45s. Epicentre 8°0S. 127°5E.

A = -603, B = +786, C = -139; D = +793, E = +609;
G = +085, H = -110, K = -990.

Direct comparison of the records of this earthquake with that of Nov. 23d. 22h. suggests that they have the same origin. A focal depth 0.030 below normal has therefore been assumed, as also for the same epicentre on Nov. 23d. 22h., though the evidence of the antiecentric stations is not clear. The residuals suggest that the epicentre is further east, say at 129°0, but the material is not quite good enough to give a secure determination.

Station and Component.	Machine.	Corr. for Focus	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
					M. S.	S.	M. S.	S.	M.	M.
Batavia	W.	-1.2	20.6	274	i 4 55	+21	i 8 54	+44	—	10.2
Manila	W.	-1.5	23.5	344	i 5 1	- 4	—	—	5.4	6.4
Perth	M.	-1.7	26.3	203	(5 46)	+12	5 46	? P	10.0	10.9
Adelaide	M.	-1.9	28.8	161	5 55	- 2	11 5	+26	13.8	15.9
Hokoto	O.	-2.2	33.2	10	5 53	-45	—	—	—	—
Taihoku	O.	-2.2	33.5	350	5 28	-73	8 20	-216	10.8	16.5
Melbourne	M.	-2.2	33.7	156	i 6 33	-10	11 33	-27	14.4	16.1
Riverview	W.	-2.2	33.8	142	e 6 29	-14	i 11 44	-17	e 14.2	15.6
Sydney	M.	-2.2	33.9	142	6 21	-23	12 9	+ 6	17.0	19.4
Zi-ka-wei	E.	-2.5	39.6	352	i 7 21	-10	12 55	-30	16.6	17.6
Kobe	O.	-2.7	43.2	10	7 48	-11	—	—	17.4	19.7
Osaka	O.	-2.7	43.3	10	7 57	- 3	14 6	- 9	20.7	22.5
Tokyo	O.	-2.8	45.1	14	8 1	-12	10 3	-276	14.4	—
Mizusawa	E.	-3.0	48.8	15	8 31	- 8	15 19	- 6	—	—
	N.	-3.0	48.8	15	8 30	- 9	15 7	-18	—	—
Calcutta	E.	-3.1	49.0	310	8 51	+12	15 51	+24	22.8	29.3
Colombo	M.	-3.1	49.8	286	8 33	-12	(15 3)	-34	15.0	36.8
Kodaikanal	M.	-3.3	53.1	290	8 51	-15	16 51	+35	16.8	32.2
Ootomari	O.	-3.4	56.3	13	10 33	+68	18 3	+68	24.0	28.9
Apia	W.	-3.6	59.8	101	i 9 52	+ 5	i 17 15	-21	29.2	—
Bombay	O.E.	-3.6	60.2	299	10 21	+31	—	—	—	36.6
Dehra Dun	O.	-3.6	61.0	312	10 15	+20	—	—	—	—
Simla	O.E.	-3.6	62.0	312	9 39	-22	17 57	- 7	e 28.8	30.2
Mauritius	N.	-3.8	68.2	252	10 33	- 8	(20 15)	+57	20.2	41.7
	E.	M.	3.8	68.2	10 21	-20	20 15	+57	20.2	42.2
Honolulu	M.	-4.0	78.7	68	12 3	+16	21 3	-19	35.2	46.3
Helwan	M.	-4.4	99.4	300	13 45	+ 2	17 57	? PR ₁	—	66.0
Sitka	B.O.	-4.4	100.6	35	e 17 20	? PR ₁	23 37	-91	e 31.7	31.9
Cape Town	M.	-4.4	101.0	234	13 33	-19	24 3	-79	32.0	32.8
Lemberg	B.O.	-4.5	104.8	320	e 14 15	+ 3	i 24 47	-72	e 58.9	65.2
Athens	—	-4.5	106.2	308	e 13 9	-70	i 24 42	-90	46.2	55.1
Budapest	—	-4.6	108.4	317	15 3	+34	28 15	+104	—	—
Victoria	M.	-4.6	108.9	41	13 29	-62	17 55	? 26.3	26.3	62.6
	Z.	—	-4.6	108.9	41	—	18 33	? 25.9	25.9	62.8
Zagreb	W.	-4.6	110.7	315	e 14 30	-10	i 26 41	-12	60.2	65.2
Graz	W.	-4.6	110.8	318	14 32	- 8	28 47	+113	—	—
Berkeley	Z.	-4.6	110.8	50	e 14 22	-18	e 28 8?	+74	—	—
Lick	W.	-4.6	111.4	51	18 59	? PR ₁	—	—	—	—
Pola	W.	-4.6	112.6	315	i 19 8	? PR ₁	i 25 13	-117	i 28.9	68.4
Pompeii	O.A.	-4.6	112.7	310	e 18 56	? PR ₁	e 24 21?	-170	44.2	54.2
Rocca di Papa	Ag.	-4.7	113.8	311	18 6	[-27]	24 39	-161	e 51.7	71.2
Hohenheim	B.O.	-4.7	114.4	320	19 38	? PR ₁	30 3	+158	—	—
Zurich	—	-4.7	115.4	317	18 40	[+ 1]	i 25 23	-131	—	—
De Bilt	G.	-4.7	115.8	322	14 55	- 8	e 29 11	+93	e 59.2	60.8
Moncalieri	G.	-4.7	116.6	316	15 0	- 7	i 29 45	+120	47.5	73.9
Uccle	G.	-4.7	116.7	321	e 15 0	- 7	—	—	e 55.2	62.2
Besançon	—	-4.7	117.2	317	19 58	? PR ₁	29 32	+102	—	—
Dyce	Ma.	-4.8	117.6	330	20 6	? PR ₁	i 29 36	+104	59.1	60.7
Edinburgh	M.	-4.8	118.6	329	15 15	0	—	—	—	85.2
Paris	G.	-4.8	118.6	320	e 18 46	[- 3]	i 25 35	-145	56.2	63.2

Continued on next page.

Station and Component.	Machine.	Corr. for Focus	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
					M. S.	S.	M. S.	S.	M.	M.
Eskdalemuir	G.	-4.8	118.8	329	15	4	-12	29 49	+107	—
Marseilles	Ma.	-4.8	118.9	313	i 20	6	? PR ₁	i 29 55	+112	67.2
Kew	M.	-4.8	119.1	323	19	15	? PR ₁	—	—	36.2
Oxford	M.S.	-4.8	119.6	323	15	8	-11	(38 15)	?	—
West Bromwich	M.S.	-4.8	119.6	324	20	14	? PR ₁	—	—	—
Bidston	M.S.	-4.8	119.7	325	19	27	? PR ₁	25 33	-156	80.2
Shide	M.S.	-4.8	120.1	321	15	16	-26	30 5	+113	60.6
Tucson	E. B.O.	-4.8	120.8	54	20	6	? PR ₁	27 2	-76	54.2
Barcelona	—	-4.8	121.4	313	e 18	51	-5	30 17	+114	53.7
Tortosa	—	-4.9	122.8	313	18	56	-4	31 50	?	52.5
Rio Tinto	M.	-5.0	129.1	312	22	15	? PR ₁	—	—	38.2
San Fernando	—	-5.0	129.2	311	18	57	-19	—	—	—
Lawrence	W.	-5.0	130.7	42	e 19	2	-18	21 9?	? PR ₁	22.3
St. Louis	W.	—	134.3	40	—	—	—	i 22 36	? PR ₁	—
Ann Arbor	E. B.	—	135.9	32	19	3	[-29]	—	—	58.2
Chacarita	M.	—	137.0	173	46	15	? [L]	—	—	66.0
Toronto	M.	—	137.3	30	18	15	+75	i 23 3	? PR ₁	i 65.8
Ottawa	—	—	137.6	25	i 19	16	[-19]	i 22 47	? PR ₁	e 68.2
Pilar	E. M.	—	138.9	168	23	3	? PR ₁	(46 27)	? [L]	76.0
	N. M.	—	138.9	168	22	51	? PR ₁	(46 57)	? [L]	76.0
Ithaca	E. B.O.	—	139.6	27	e 20	24	+45	e 32 22	+80	e 56.9
	N. B.O.	—	139.6	27	e 20	22	+43	e 32 59	+117	—
Northfield	B.O.	—	139.8	21	19	14	-25	22 53	? PR ₁	55.2
Andalgala	E. M.	—	141.7	160	20	27	-15	—	—	80.4
	N. —	—	141.7	160	20	3	-39	—	—	78.9
Harvard	E. B.O.	—	141.9	22	i 17	50	+31	—	—	—
	N. B.O.	—	141.9	22	e 19	1	[-42]	i 31 33	+19	e 69.3
Washington	Mar.	—	142.0	31	19	15	-28	—	—	62.2
Georgetown	E. —	—	142.0	31	19	23	-20	32 10?	+55	61.0
	N. —	—	142.0	31	19	23	-20	32 25	+70	62.2
Cheltenham	N. B.O.	—	142.2	31	19	22	-21	23 8	? PR ₁	33.2
La Quiaca	E. M.	—	147.6	158	15	27	-134	—	—	—
La Paz	Bi.	—	151.0	149	19	50	-7	33 55	?	71.1
Balboa Hts.	E. B.O.	—	153.2	86	19	43	-17	—	—	42.5?
	N. B.O.	—	153.2	86	19	51	-9	—	—	42.9?
Vieques	E. B.O.	—	163.8	50	20	40	+29	—	—	65.4
	N. B.O.	—	163.8	50	20	5	[-6]	—	—	76.2

Additional records: Batavia ML = +46.2m., T₀ = 18h.41m.39s. Manila MN = +6.0m., T₀ = 18h.40m.46s. But the Manila records probably refer to another shock at about 14° 8'N. 124° 5'E. (as in the U.S. Weather Bureau, Philippine Catalogue), with T₀ = 18h.45m.0s., and the Taihoku records seem also to refer to this shock. Adelaide PR₁ = +7m.45s. Riverview iP = +6m.31s., i = +6m.49s., PR₁ = +8m.4s., PS = +12m.14s., T₀ = 18h.41m.55s. Sydney SR₁ = +13m.39s. Zi-ka-wei PSE = +13m.21s., PSN = +13m.49s., SR₁E = +14m.44s., SR₂E = +15m.37s., SRN = +15m.43s., SR₂E = +16m.11s., MN = +25.4m. Apia i₁ = +18m.15s., i₂ = +19m.45s., i₃ = +21m.33s., i₄ = +24m.33s. Sitka ePE = +17m.33s., ME = +27.1m. Lemberg ME = +18.8m. and +25.0m. Athens ePE = +13m.13s., MN = +53.2m., T₀ = 18h.41m.14s. Zagreb iPR₁ = +19m.11s., iNE = +24m.54s., i = +26m.8s., e = +44m.15s., T₀ = 18h.41m.52s. Berkeley eSE = +28m.3s., Pola MN = +62.1m. Pompeii L = +50.2m. Rocca di Papa MN = +63.2m. De Bilt iPR₁E = +19m.48s., iPR₁N = +19m.50s., iE = +22m.19s., i = +25m.24s. Epicentre 10° 0'S. 130° 0'E. Moncalieri i = +19m.42s., MN = +76.6m. Uccle iPR₁ = +18m.40s., e₁ = +19m.45s., i₁ = +22m.15s. Dyce i = +25m.38s., i = +31m.6s. Paris i = +20m.8s., SR₁ = +30m.2s. Eskdalemuir PR₁ = +20m.0s., PR₂ = +25m.32s. Oxford PR₁ = +20m.15s. Shide PR₁ = +20m.19s. Tucson PN = +20m.35s. Barcelona i = +20m.26s., PR₂? = +25m.43s. Lawrence ePN = +19m.4s.? Ann Arbor SN = +19m.9s., MN = +70.2m. Toronto eL = +33.4m., +81.0m. and 124.2m., M = 42.5m. Ottawa i = +21m.55s., E? = +41m.33s., eL = +57.2m. Ithaca iN = +24m.7s., iE = +24m.8s. Harvard PR₁E = +19m.33s., PR₁N = +19m.45s., PR₁N = +22m.40s., PR₁E = +23m.16s., SR₁ = +41m.20s., SR₂ = +47m.31s., T₀ = 18h.41m.55s. Washington PR₁ = +22m.20s. Georgetown iN = +22m.59s., iE = +23m.3s., and +40m.43s. Cheltenham PE = +19m.15s., SE = +23m.5s. La Quiaca PN = +15m.21s., MN = +90.7m. La Paz iPN = +19m.51s., PR₁N = +23m.36s., SR₁N = +39m.15s., LN = +67.2m.

Nov. 18d. Records also at 1h. (Manila), 3h. (Taihoku and Zi-ka-wei), 4h. (De Bilt), 6h. (Athens), 8h. (Edinburgh), 9h. (Mizusawa), 11h. (Tokyo), 13h. (Taihoku, Algiers, and Mizusawa), 15h. (Zurich), 17h. (Ascension), 18h. (Coimbra), 19h. (Pompeii), 21h. (Zi-ka-wei), 22h. (De Bilt).

Nov. 19d. Records at 1h. (Batavia), 4h. (Batavia), 5h. (Batavia, Tokyo, Helwan, Zi-ka-wei and Manila), 6h. (Colombo), 7h. (Paris), 8h. (Manila), 20h. (Batavia), 21h. (Tokyo).

Nov. 20d. 7h. 33m. 0s. Epicentre $40^{\circ}0'N$. $20^{\circ}0'E$. (as on 1917 Oct. 18d.).

$$A = +.720, B = +.262, C = +.643; \quad D = +.342, E = -.940; \\ G = +.604, H = +.220, K = -.766.$$

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3.6	123	e 0 55	- 1	1 37	- 2	1.8	2.2
Rocca di Papa	5.8	291	e 1 41	+ 11	—	—	—	4.3
Zagreb	6.5	335	e 1 43	+ 4	1 3 6	+ 9	3.7	4.2
Budapest	7.5	355	e 2 30	+ 36	—	—	—	—
Graz	7.8	344	e 2 16	+ 18	—	—	—	—
Moncalieri	10.3	303	—	—	—	—	6.8	—
De Bilt	E. 15.8	325	—	—	—	—	e 9.5	12.9
N. 15.8	325	—	—	—	—	—	e 9.2	11.1
Edinburgh	22.0	333	4 30	- 35	—	—	—	—

Additional records: Athens gives $iP = +1m.3s.$, $M = +2.0m.$, $MN = +2.5m.$, $T_0 = 7h.33m.3s.$, Zagreb $eNE = +1m.56s.$, $i = +2m.21s.$, $+2m.50s.$, and $+3m.20s.$

Nov. 20d. Records also at 0h. (Tokyo), 1h. (La Paz and Manila), 4h. (Helwan), 5h. (San Fernando), 6h. (Victoria), 8h. (Pompeii), 16h. (Lick).

Nov. 21d. Records at 0h. (Zi-ka-wei and Manila), 1h. (Osaka, Batavia, Helwan, De Bilt, and Eskdalemuir), 3h. (Manila (2)), 6h. (Mizusawa), 7h. (Rio Tinto, San Fernando, and Vieques), 9h. (Tokyo), 16h. (Simla and La Paz), 18h. (Lick), 21h. (Taihoku (2)), 22h. (La Paz), 23h. (Helwan and San Fernando).

1918. Nov. 22d. 15h. 48m. 30s. Epicentre 46°5N. 151°4E.

(as on 1918 Sept. 8d.).

A = -604, B = +330, C = +725; D = +479, E = +878;
G = -637, H = +347, K = -688.

Station and Component.	Machine.	\angle	Azimuth.	P.	O	C	S.	O-C	L.	M.
				M.	S.	S.	M.	S.	M.	M.
Ootomari	O.	5.9	285	2	0	+29	—	—	3.6	4.5
Mizusawa	E.	10.5	229	2	49	+12	4	52	—	—
	O.	10.5	229	2	54	+17	4	47	+4	—
Osaka	O.	16.8	231	3	33	-29	—	—	8.0	10.6
Zi-ka-wei		27.6	247	e 6	10	+6	e 10	54	+2	—
Taihoku	O.	32.0	238	—	—	—	12	17	+9	—
Manila	W.	40.8	229	e 7	50	-11	—	—	—	—
Honolulu	M.	47.9	104	14	54	? S	(14	54)	-59	26.5
Victoria	M.	54.6	54	16	30	? S	(16	30)	-46	—
Bombay	O.E.	68.7	275	36	33	? L	—	—	(36.6)	44.9
Kodaikanal	M.	71.6	265	47	36	? L	—	—	(47.6)	—
Colombo	M.	72.3	261	48	30	? L	—	—	(48.5)	54.5
Edinburgh	M.	75.4	346	21	30	? S	(21	30)	0	65.5
Eskdalemuir	G.	75.9	345	12	3	+9	21	47	+11	—
De Bilt		77.3	340	12	8	+5	22	0	+8	e 35.5
Bidston	M.S.	77.7	345	21	48	? S	(21	48)	-9	—
Uccle	—	78.9	340	e 11	6	-66	—	—	e 42.5	48.5
Kew	M.	79.0	342	—	—	—	—	—	—	49.5
Ottawa		79.2	32	—	—	—	e 42	30	? L	e 49.5
Toronto	M.	79.3	35	—	—	—	—	—	—	45.0
Zagreb	W.	79.7	330	e 12	19	+2	e 22	12	-8	45.5
Shide	M.S.	79.9	343	18	43	?	—	—	—	43.2
Paris	—	80.9	340	—	—	—	—	—	e 44.5	54.5
Hohenheim		82.1	336	—	—	—	—	—	—	54.2
Moncalieri	S.	83.1	335	e 12	43?	+6	23	2?	+4	39.8
Georgetown		84.2	36	e 41	30	? L	—	—	(e 41.5)	—
Rocca di Papa	Ag.	84.4	330	e 46	5	? L	—	—	—	54.6
Helwan	M.	86.4	311	23	30	? S	(23	30)	-4	—
Barcelona		87.9	337	—	—	—	—	—	e 47.9	56.5
San Fernando		94.7	342	56	30	? L	—	—	(56.5)	64.5
La Paz	Bi.	135.7	61	e 19	44	[+13]	—	—	75.5	82.2
Cape Town	M.	142.5	273	49	48	?	—	—	—	92.8

Additional records: Ootomari gives MN = +4.2m. Osaka MN = +12.3m.
De Bilt eSR₁N = +27m.34s., eLN = +41.5m., T₀ = 15h.48m.44s. Bidston
S = +29m.30s. (?SR₁). Ottawa L = +55.5m. Toronto L = +49.1m.
Zagreb MNW = +51.5m., T₀ = 15h.48m.54s. Moncalieri MN = +50.4m.,
T₀ = 15h.48m.52s. Georgetown eLN? = +49.9m., eLE? = +49.5m.
San Fernando MN = +62.0m. La Paz iP = +22m.59s. (?PR₁).

Nov. 22d. Records also at 13h. (Pompeii), 18h. (Zi-ka-wei and Barcelona), 21h. (Taihoku and Helwan), 22h. (Manila, La Paz, and Batavia).

1918. Nov. 23d. 22h. 57m. 45s. Epicentre 8° 0S. 127° 5E.

(as on 1918 Nov. 18d. 18h.).

A = -·603, B = +·786, C = -·139; D = +·793, E = +·609;

G = +·085, H = -·110, K = -·990.

A focal depth 0·030 has been assumed.

Station and Component.	Machine.	Corr. for Focus	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
					M. S.	S.	M. S.	S.	M.	M.
Batavia	W.	-1·2	20·6	274	i 5 56	+82				11·2
Milan	Ag.	-1·5	23·5	344	5 1	- 4	i 8 9	-56	i 9·2	9·2
Perth	M.	-1·7	26·3	203	6 28	+50	10 25	+30	10·4	
Adelaide	M.	-1·9	28·8	161	6 7	+10	10 37	- 2	13·8	16·4
Taihoku	O.	-2·2	33·5	350	7 25	+44			11·5	14·8
Melbourne	M.	-2·2	33·7	156	6 27	16	11 51?	- 9		
Riverview	—	-2·2	33·8	142	i 6 41	- 2	i 11 56	- 5	13·2	18·0
Sydney	E. M.	-2·2	33·9	142	4 51	-113	12 3	0	18·2	19·0
Kobe	O.	-2·7	43·2	10	6 48	-79			13·0	16·2
Osaka	O.	-2·7	43·3	10	7 57	- 3			13·9	17·4
Tokyo	O.	-2·8	45·1	14	8 18	+ 5	14 9	-30	16·2	—
Mizusawa	E. O.	-3·0	48·8	15	8 26	-13	15 2	-23		—
	N. O.	-3·0	48·8	15	8 29	-10	15 5	-20		—
Calcutta	O.E.	-3·1	49·0	310	8 51	+12	15 51	+24	21·6	—
Colombo	M.	-3·1	49·8	286	8 9	-36	10 33	? PR ₁	16·0	31·8
Kodaikanal	M.	-3·3	53·1	290	8 51	-15			12·2	37·4
Ootomari	O.	-3·5	56·3	13	63 31	?			70·8	72·1
Apia	W.	-3·6	59·8	101	9 55	+ 8	17 51	+15	25·8	—
Simla	O.E.	-3·6	62·0	312	9 45	-16	17 57	- 7	29·0	29·8
Mauritius	M.	-3·8	68·2	252	11 27	+46	19 3	-15	19·0	36·0
Honolulu	M.	-4·0	78·7	68	e 12 39	+52	21 33	+11	36·0	48·4
Helwan	M.	-4·4	99·4	300	14 3	+20	18 27	? PR ₁		63·6
Cape Town	M.	-4·4	101·0	234	24 9	? S	(24 9)	-73		60·0
Victoria	M.	-4·6	108·9	41	23 51	? S	32 42	? SR ₁	44·0	69·1
Zagreb	W.	-4·6	110·7	315	e 14 22	-18	i 26 33	-20	62·2	70·2
Berkeley	—	-4·6	110·8	50			e 24 42	-132		
Rocca di Papa	Ag.	-4·7	113·8	311	e 18 39	? PR ₁				75·4
De Bilt	E. —	-4·7	115·8	322	(25 17)	?	i 26 31	-67	e 59·2	59·8
	N. —	-4·7	115·8	322	(19 50)	? PR ₁	e 27 8	-30	e 58·2	60·2
Moncalieri	S.	-4·7	116·6	316	18 45	[+ 2]	28 39	+54	47·0	68·3
Uccle	—	-4·7	116·7	321	e 17 33	+146	e 26 15	-91	e 46·2	60·2
Edinburgh	M.	-4·8	118·6	329	16 15	+60				—
Eskdalemuir	G.	-4·8	118·8	329	20 7	? PR ₁	30 43	+161	49·2	61·1
Kew	M.	-4·8	119·1	323						68·2
Stonyhurst	M.	-4·8	119·2	325	i 19 57	? PR ₁	i 30 39	+154		72·4
Bidston	M.S.	-4·8	119·7	325	19 15	[+24]	29 45	+96		64·2
Slide	M.S.	-4·8	120·1	321	19 56	? PR ₁	26 54	-78	43·4	67·7
Barcelona	—	-4·8	121·4	313	e 20 3	? PR ₁	31 16	+173	e 50·3	67·9
Algiers	B.M.	-4·8	122·1	308	20 29	? PR ₁	31 25	+177	56·2	74·2
Tortosa	—	-4·9	122·8	313	18 55	[- 6]			51·4	64·5
Rio Tinto	M.	-5·0	129·1	312	25 15	?				31·2
San Fernando	—	-5·0	129·2	311	23 15	?			76·2	82·2
Coimbra	—	-5·0	129·3	316	21 20	? PR ₁	31 24	+123	e 52·8	67·8
Toronto	M.	—	137·3	30	27 57	?	38 33	? SR ₁	e 80·2	84·8
Ottawa	—	—	137·6	25	i 22 35	? PR ₁	e 33 45	?	82·2	
Pilar	N. M.	—	138·9	168					73·8	87·8
Northfield	B.O.	—	139·8	21	e 18 25	?				
Andalgala	E. M.	—	141·7	160						84·0
Harvard	B.O.	—	141·9	22	e 11 46	?	19 17	[-26]	41·6	—
Washington	Mar.	—	142·0	31	e 19 28	[-15]	22 25	? PR ₁	41·2	—
Cheltenham	N. B.O.	—	142·2	31	22 15	? PR ₁			74·8	79·2
La Paz	Bi.	—	151·0	148	e 19 50	[- 7]	33 51	?	63·2	78·6
Balboa Heights	B.O.	—	153·2	86	20 15	[+15]				—

For Notes see next page.

NOTES TO NOV. 23d. 22h. 57m. 45s.

Additional records: Manila gives $iE = +5m.35s.$, $iN = +6m.3s.$, $iE = +7m.2s.$, $iN = +7m.19s.$ Adelaide $PR_1 = +6m.59s.$, $SR_1 = +12m.52s.$
 Riverview $eP = +6m.36s.$, $PR_1 = +8m.1s.$, $iS = +11m.47s.$, $PS = -12m.4s.$, $MN = +18.2m.$, $MZ = +18.0m.$, $T_0 = +22h.57m.48s.$ Syd-
 ney $SR_1 = +13m.15s.$, Mauritius $MN = +21.2m.$ Victoria $E = +30m.29s.$, $L = +48.4m.$ Zagreb $iNE = +19m.16s.$, $MNW = +67.2m.$,
 $T_0 = 22h.57m.46s.$ Moncalieri $i = +19m.48s.$, $MN = +60.1m.$ Shide
 $SR_1 = +31m.20s.$ Barcelona $MN = +70.8m.$ Coimbra $i = +38m.28s.$
 Toronto $L = +48.8m.$ Ottawa $i = +22m.50s.$ and $+23m.29s.$, $L? = +67.2m.$ Andalgala $MN = -83.6m.$ Harvard $iE = -12m.6s.$ and
 $+29m.12s?$, $eLE = +36.9m.$, $eLN = +40.7m.$, $T_0 = 22h.52m.11s.$ Chel-
 tenham $PE = +23m.5s.$ La Paz $L = +71.4m.$

Nov. 23d. Records also at 0h. (Manila and Batavia), 1h. (San Fernando, Manila, Colombo, and Helwan), 5h. (Mizusawa (2)), 6h. (Helwan and Paris), 17h. (Tacubaya), 18h. (Zi-ka-wei), 19h. (Zi-ka-wei and Taihoku), 21h. (San Fernando), 22h. (Zi-ka-wei).

Nov. 24d. 19h. 56m. 35s. Epicentre $36^\circ 0'N$. $138^\circ 0'E$. (as on 1915 Oct. 8d.).

$A = -.601$, $B = +.541$, $C = +.588$.

	Δ	P.	O-C.	S.	O-C.	M.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	1.5	0 16	- 7	0 44	+ 2	—	—
Osaka	2.5	0 39	0	—	—	1.4	1.8
Kobe	2.7	1 0 40	- 2	—	—	1.3	1.7
Mizusawa	E. 4.0	0 55	- 7	1 55	+ 5	—	—
	N. 4.0	1 1	- 1	1 52	+ 2	—	—

Kobe gives $MN = +1.5m$.

Nov. 24d. Records also at 0h. (Cheltenham and Washington), 3h. (Tokyo), 8h. (Mizusawa), 9h. (Zi-ka-wei), 10h. (Osaka and Nagasaki), 11h. (De Bilt, Manila, and Eskdalemuir), 12h. (La Paz and La Quiaca), 13h. (Rocca di Papa), 17h. (Batavia and Manila), 23h. (Bombay).

Nov. 25d. 2h. 14m. 7s. Epicentre $46^\circ 5'N$. $28^\circ 3'W$.

$A = +.606$, $B = -.326$, $C = +.725$; $D = -.474$, $E = -.880$;

$G = +.639$, $H = -.344$, $K = -.688$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Coimbra	15.7	106	3 56	+ 8	5 29	-79	7.1	8.5
Bidston	17.5	58	2 53	?	8 35	?L	(8.6)	11.4
Eskdalemuir	17.9	52	4 15	- 1	7 38	0	8.6	—
Stonyhurst	18.0	56	4 23	+ 6	—	—	9.1	10.4
Shide	18.2	67	4 20	+ 1	—	—	8.5	14.0
Edinburgh	18.2	50	4 23	+ 4	—	—	—	10.4
Kew	18.9	64	—	—	—	—	—	11.9
San Fernando	19.3	114	8 53	?L	—	—	(8.9)	11.9
Tortosa	21.5	95	5 3	+ 4	—	—	9.9	11.2
Uccle	21.8	67	3 53	-70	e 7 53	-68	e 9.9	—
Barcelona	22.3	92	e 5 8	- 1	9 15	+ 4	10.2	13.1
De Bilt	22.3	63	5 8	- 1	9 5	- 6	10.5	12.4
Moncalieri	24.9	80	5 33	- 4	—	—	12.1	—
Zurich	24.9	74	e 5 36	- 1	—	—	—	—
Algiers	25.2	101	e 5 31	- 9	—	—	12.4	13.2
Rocca di Papa	29.4	84	—	—	e 11 s	-16	—	17.5
Graz	29.6	73	6 13	-11	—	—	—	—
Zagreb	30.2	75	e 6 29	- 1	—	—	e 12.9	16.9
Ottawa	32.5	286	—	—	e 13 11	+55	e 16.4	—
Toronto	35.6	284	—	—	—	—	13.2	22.2
Helwan	48.5	88	16 53	?S	(16 53)	+53	—	—

Additional records: Coimbra gives $LN = +7.0m.$, $MN = +8.2m.$, $T_0 = 2h.16m.9s.$
 San Fernando $PN = +8m.23s.$ (?LN). Barcelona $MN = +11.8m.$, $T_0 = 2h.14m.6s.$
 De Bilt $MN = +11.9m.$, $T_0 = 2h.14m.18s.$ Epicentre $46^\circ 9'N$.
 $28^\circ 8'W$. Zagreb $MNW = +19.9m.$ Ottawa $LE = +18.9m.$, $LN = +20.9m.$
 Toronto $eL = +21.2m.$

Nov. 25d. 12h. 38m. 48s. Epicentre $36^{\circ}4'N$, $27^{\circ}5'E$.

A = +.714, B = +.372, C = +.593; D = +.462, E = -.887;

G = +.526, H = +.274, K = -.805.

	Δ °	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	3.4	299	e 0 53	0	1 34	0	1.8	2.2
Rocca di Papa	12.7	300	3 6	- 3	—	—	(e 6.8)	—
Zagreb	12.8	321	e 3 12	+ 2	—	—	e 7.2	8.9
Graz	13.9	324	e 3 24	—	—	—	—	—
Uccle	22.0	318	e 4 48	-17	—	—	—	—
De Bilt	22.3	322	4 56	-13	—	—	e 14.2	15.4

Additional records: Athens gives MN = -2.6m. Rocca di Papa M = +3.8m. The L and M given are recorded as a second shock.

Nov. 25d. Records also at 2h. (La Paz), 7h. (Taihoku), 12h. (Manila, Helwan, Tokyo, and Edinburgh).

Nov. 26d. Records at 0h. (San Fernando), 2h. (Tokyo and Osaka), 4h. (Taihoku), 7h. (Osaka and Tokyo), 8h. (Osaka and Tokyo), 11h. (Rocca di Papa and Zagreb), 13h. (Mizusawa and Tokyo), 14h. (Rocca di Papa).

Nov. 27d. Records at 1h. (Helwan, De Bilt, Riverview, Adelaide, and Perth), 2h. (Helwan and San Fernando), 7h. and 8h. (La Paz), 9h. (Rocca di Papa), 10h. (Helwan), 12h. (Athens), 19h. (Batavia).

Nov. 28d. 2h. 43m. 2s. Epicentre $36^{\circ}4'N$, $27^{\circ}5'E$. (as on 1918 Nov. 25d. 12h.).

A = -.714, B = -.372, C = -.593.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	3.4	e 0 56	+ 3	1 32	- 2	1.8	2.0
Helwan	7.2	3 58	?L	—	—	(4.0)	—
Zagreb	12.8	3 7	- 3	—	—	—	9.6
Graz	13.9	e 3 25	0	—	—	—	—
De Bilt	22.3	—	—	—	—	e 12.7	—

No additional records.

Nov. 28d. 5h. 21m. 17s. Epicentre $31^{\circ}0'S$, $179^{\circ}0'E$.

A = -.857, B = +.015, C = -.515; D = -.017, E = +1.000;

G = +.515, H = -.009, K = -.857.

	Δ °	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	19.2	28	4 29	- 2	8 7	+ 1	—	—
Riverview	23.6	256	i 5 25	+ 1	9 32	- 4	10.9	15.1
Adelaide	33.9	256	(7 7)	+ 3	10 32	-127	11.7	14.2
Perth	53.1	255	9 55	-28	—	—	—	—
Batavia	71.5	276	e 11 43	+16	—	—	—	22.7
Manila	72.0	301	e 11 29	- 1	—	—	—	20.4
Osaka	77.4	326	17 41	?PR ₂	—	—	—	22.3
La Paz	100.0	118	e 14 55	+44	24 3	-113	46.7	—
Colombo	101.4	274	28 7	?S	(28 7)	+118	—	—
Helwan	152.2	276	23 43	?PR ₁	—	—	—	—
Edinburgh	154.9	3	43 23	?SR ₁	—	—	—	—
Eskdalemuir	155.6	3	—	—	30 43	?	—	—
Bidston	157.5	3	23 55	?PR ₁	35 43	?	—	81.2
De Bilt	158.4	350	e 24 13	?PR ₁	e 30 49	?	e 49.7	51.8
Graz	159.5	326	e 20 46	[-38]	—	—	—	—
Kew	159.5	359	—	—	—	—	—	44.7
Zagreb	160.2	323	e 19 55	[-13]	—	—	45.7	—
Rio Tinto	171.8	33	22 43	?	—	—	—	47.7
San Fernando	173.1	37	18 43	?	—	—	—	45.7

Additional records: Riverview gives iP = +5m.31s., ePR₁? = +6m.7s., +6m.23s. and +7m.31s., PS? = +9m.54s., MN = +14.9m. Adelaide P = +5m.52s., the P given in the table is recorded as PR₁. La Paz PR₁ = +18m.50s. De Bilt eN = +35m.50s. and +39m.2s., eE = +44m.11s. and +45m.37s.

Nov. 28d. Records also at 0h. (San Fernando and La Paz), 1h. (La Paz), 2h. (Batavia), 5h. (Manila), 9h. (Kodaikanal), 14h. (Zante and Mizusawa), 19h. (Mizusawa, Tokyo, and Osaka), 20h. (Batavia, Colombo, Zi-ka-wei, and Helwan), 22h. (San Fernando).

Nov. 29d. 10h. 41m. 50s. Epicentre $30^{\circ}0'N$, $71^{\circ}0'E$. (as on 1917 Dec. 1d. 9h.).

A = +.282, B = +.819, C = +.500; D = +.946, E = -.326;
G = +.163, H = +.473, K = -.866.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Simla	5.5	76	1 10	-15	2 4	-27	2.6	2.8
Bombay	11.2	171	5 19	?S	(5 19)	+20	—	8.0
Calcutta	17.3	112	1 58	?	9 58	?L	(10.0)	—
Kodaikanal	20.7	161	12 16	?L	—	—	(12.3)	—
Colombo	24.5	158	13 40	?L	—	—	(13.7)	18.7
Lemberg	40.2	313	e 9 10	+73	—	—	—	21.6
Zi-ka-wei	43.0	75	e 14 37	?S (e 14 37)	—	-11	—	—
Budapest	43.2	310	e 12 26	?	—	—	—	—
Taihoku	44.8	83	19 10	?SR ₁	—	—	—	—
Zagreb	45.2	309	e 10 10	+96	—	—	23.2	27.2
Graz	45.6	310	e 7 0	-97	—	—	—	—
Rocca di Papa	47.8	301	e 12 40	?	—	—	23.0	26.1
Manila	48.3	98	—	—	e 14 10	-108	25.5	27.0
Hohenheim	49.8	312	—	—	e 18 36	?	—	—
De Bilt	52.2	315	—	—	e 16 43	-3	22.2	25.1
Uccle	52.8	314	—	—	—	—	e 24.2	—
Paris	54.2	311	—	—	—	—	e 23.2	31.2
Barcelona	55.6	303	—	—	—	—	e 27.0	—
Kew	55.7	315	—	—	—	—	—	28.2
Edinburgh	56.9	320	24 10	?L	—	—	(24.2)	33.7
Eskdalemuir	57.0	319	—	—	—	—	23.2	—
Bidston	57.1	317	21 46	?	27 22	?L	(27.4)	34.2
Rio Tinto	63.1	300	30 10	?L	—	—	(30.2)	38.2
San Fernando	63.2	299	32 22	?L	—	—	(32.4)	36.7

Additional records: Zagreb gives MNW = -24.2m.

Paris MN = +27.2m.

San Fernando MN = +36.2m.

Nov. 29d. Records at 0h. (Colombo), 2h. (Helwan), 3h. (San Fernando), 4h. (Balboa Heights and La Paz), 7h. (Manila and Shide), 8h. (Zagreb), 9h. (Athens), 10h. (La Paz), 16h. (Zagreb), 18h. (Balboa Heights).

Nov. 30d. 1h. 33m. 30s. Epicentre $22^{\circ}0'N$, $151^{\circ}0'E$.

A = -.811, B = +.450, C = +.375.

	Δ	Az.	P.	O-C.	S.	O-C.
			m. s.	s.	m. s.	s.
Mizusawa	19.1	336	4 35	+5	8 13	+9
Zi-ka-wei	27.9	295	e 5 57	-10	10 41	-16
Manila	29.4	261	e 6 30	+8	—	—
La Paz	142.8	88	i 19 40	[-5]	—	—

Mizusawa SN = +8m.14s.

La Paz also gives eP = +18m.54s.

Nov. 30d. 6h. 48m. 31s. Epicentre $70^{\circ}1'N$, $132^{\circ}0'E$. (suggested by De Bilt).

A = -.228, B = +.253, C = +.940; D = +.743, E = +.669;
G = -.629, H = +.699, K = -.340.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Ootomari	24.0	164	10 16	?S	(10 16)	+32	—	—
Mizusawa	31.3	168	6 42	+1	11 55	-1	—	—
	31.3	168	6 39	-2	11 57	+1	—	—
Kobe	35.5	178	e 8 49	?PR ₁	—	—	22.8	24.1
Osaka	35.5	176	7 40	+22	—	—	—	23.3
Zi-ka-wei	39.4	193	e 7 46	-4	e 13 50	-7	—	26.6
Taihoku	45.5	192	23 59	?L	—	—	(24.0)	—
Lemberg	49.4	308	—	—	e 15 29	-42	—	27.5
Victoria	49.8	58	—	—	20 32	?SR ₁	28.2	33.6
Edinburgh	50.0	330	16 29	?S	(16 29)	+10	—	34.0
Eskdalemuir	50.5	330	—	—	16 29	+4	—	—
De Bilt	52.0	322	9 19	-1	16 43	-1	e 26.5	29.1

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Bidston		52.3	328	17 5	?S	(17 5)	+17	(26.4)	37.0
Budapest		52.9	310	e 9 44	+19	—	—	—	—
Uccle		53.3	322	e 9 23	- 5	—	—	e 32.5	—
Kew		53.7	327	—	—	—	—	—	36.5
Zagreb	N.W.	55.2	311	e 10 44	+64	—	—	—	—
Paris		55.6	322	—	—	e 19 29	?SR ₁	30.5	—
Manila		55.9	192	—	—	—	—	e 21.5	—
Moncalieri		58.1	317	13 30	?PR ₁	22 8	?SR ₁	30.0	34.5
Rocca di Papa		59.9	312	e 10 13	+ 2	—	—	e 33.7	41.2
Marseilles		60.2	319	—	—	—	—	36.5	—
Bombay		62.0	248	—	—	—	—	—	39.3
Ottawa		62.7	21	—	—	—	—	e 28.8	—
Honolulu		63.2	102	—	—	—	—	e 26.5	31.5
Toronto		64.0	26	—	—	—	—	e 35.3	39.9
Ann Arbor		64.6	30	—	—	27 29	?	—	42.5
Harvard		66.3	20	6 35?	?	—	—	e 32.8	—
Algiers		67.0	319	—	—	—	—	e 39.5	45.5
Rio Tinto		68.0	328	28 29	?L	—	—	(28.5)	34.5
Kodaikanal		68.8	240	—	—	—	—	37.7	37.9
Georgetown		68.9	26	—	—	—	—	37.5	—
Washington		68.9	26	—	—	e 39 29	?L	43.5	—
San Fernando		69.3	327	—	—	—	—	—	47.0
Colombo		71.3	237	36 29	?L	—	—	(36.5)	49.5
Batavia		78.2	208	—	—	—	—	e 43.5	—
La Paz		125.0	27	—	—	—	—	67.5	83.0

Additional records: Kobe gives MN = +24.0m. Osaka MN = +22.5m.
 De Bilt T₀ = 6h.48m.33s. Epicentre 70°1N. 132°0E., as adopted. Bidston records S as P and L as S. Ottawa LE = +33.5m., L = +36.5m.
 Toronto L = +87.9m. Ann Arbor MN = +43.5m. Harvard LE = +35.1m., LN = +40.2m. Georgetown LN = +42.5m.

Nov. 30d. Records also at 3h. (Helwan and San Fernando), 9h. (Manila and Mizusawa), 10h. (Mizusawa), 11h. (Batavia and Zurich), 12h. (Helwan), 13h. (Zurich), 20h. and 21h. (Simla), 23h. (Mizusawa).

1918. Dec. 1d. 2h. 35m. 4s. Epicentre 39°0N. 73°0E.

A = +.227, B = +.743, C = -.629; D = +.956, E = -.292;
 G = +.184, H = +.602, K = -.777.

On 1917 April 21d. an epicentre 37°2N. 70°4E. was ultimately adopted, with focus at a depth 0.03 below normal (see Bull. for Mar. and Apr. 1917, p. 6). Direct comparison of the observations on that date with those given below shows an essential difference between the two cases.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Simla	O.E.	8.6	156	1 38	-32	(3 56)	- 3	3.9	4.4
Dehra Dun	O.	9.6	153	2 26	- 2	—	—	—	—
Bombay	O.E.	20.1	181	4 41	- 1	8 20	5	—	11.1
Calcutta	E. O.E.	21.0	137	4 50	- 3	8 50	- 6	11.4	12.8
	N. O.E.	21.0	137	4 44	- 9	8 44	0	11.3	13.5
Kodaikanal	M.	29.1	171	11 2	?S	(11 2)	-17	15.1	16.0
Colombo	M.	32.7	167	11 8	—	12 38	-19	15.3	19.9
Helwan	M.	35.2	268	6 50	-25	8 32	?PR ₁	—	25.6
Lemberg	B.O.	35.9	304	17 19	- 2	—	—	19.3	24.6
Athens	E.	38.1	282	7 34	- 5	13 29	-10	e 19.4	26.9
	N.	38.1	282	7 35	4	13 31	8	—	24.7
Budapest	—	39.4	302	9 26	?PR ₁	—	—	—	—
Zi-ka-wei	—	39.9	85	e 7 42	-12	14 46	+41	—	27.2
Zagreb	W.	41.7	299	18 6	- 3	14 24	- 7	i 19.5	28.8
Taihoku	O.	42.9	92	—	—	e 18 8	?SR ₁	e 23.6	—
Pola	W.	43.4	299	e 8 16	- 5	e 17 46	?SR ₁	e 25.1	28.0
Pompeii	O.A.	44.1	291	8 24	- 3	—	—	—	—
Rocca di Papa	Ag.	45.1	295	8 32	- 2	e 15 5	-11	e 23.2	33.7

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.		O-C.	S.		O-C.	L.	M.
				M.	S.	S.	M.	S.	S.	M.	M.
Zurich	—	46.4	304	e 8	39	- 4	—	—	—	—	—
De Bilt	E.	47.4	310	8	49	- 1	15	50	+ 4	e 25.9	27.5
	N.	47.4	310	8	56	- 6	15	49	+ 3	e 21.9	27.9
Moncalieri	S.	47.6	299	8	49	- 2	15	50	+ 1	20.0	31.7
Besançon	—	48.1	304	8	46	- 9	—	—	—	—	—
Uccle	—	48.2	309	e 8	55	0	e 15	56	0	e 23.9	—
Manila	W.	48.5	104	e 8	52	- 5	14	18	-102	18.4	19.9
Osaka	O.	49.2	73	9	8	+ 7	18	6	+117	26.2	33.2
Marseilles	Ma.	49.7	299	i 9	8	+ 3	—	—	—	e 29.9	34.9
Paris	—	49.9	307	i 9	8	- 2	i 16	23	+ 5	23.9	26.9
Kew	M.	50.8	311	—	—	—	—	—	—	—	34.9
Edinburgh	M.	51.3	317	8	56	-19	—	—	—	—	33.4
Eskdalemuir	E.	51.5	316	i 9	24	+ 7	i 16	38	0	24.0	29.7
	N.	51.5	316	i 9	29	+12	i 16	37	- 1	—	—
West Bromwich	M.S.	51.5	312	9	17	0	—	—	—	—	20.8
Shide	M.S.	51.6	310	9	19	+ 2	16	58	+19	—	34.4
Bidston	M.S.	51.9	312	9	32	+13	16	50	+ 7	—	26.4
Tokyo	O.	51.9	72	9	28	+ 9	18	0	+77	24.2	—
Barcelona	—	52.6	298	i 9	28	+ 4	16	58	+ 7	e 26.1	37.6
Algiers	B.M.	53.9	290	e 9	32	0	17	6	- 2	25.9	36.9
Tortosa	—	54.3	298	9	34	- 1	17	18	+ 5	27.4	36.2
Batavia	W.	54.9	136	e 8	56	-42	—	—	—	—	21.9
Rio Tinto	M.	60.2	295	8	56	-77	—	—	—	—	43.9
Coimbra	—	60.4	299	10	30	+15	18	51	+23	30.3	36.4
San Fernando	—	60.6	293	18	8	? S	(18 8)	—	-23	36.7	39.4
Mauritius	E.	60.7	195	24	56	?	—	—	—	—	33.6
	N.	60.7	195	24	26	?	—	—	—	32.0	35.1
Cape Town	M.	88.6	222	40	20	? L	—	—	—	(40.3)	53.8
Ottawa	—	91.0	339	—	—	—	i 23	52	-32	44.9	—
Victoria	M.	91.4	10	38	5?	?	42	30	? L	49.4	55.4
Harvard	B.O.	92.4	334	—	—	—	i 24	40?	+ 1	49.8	—
Toronto	M.	93.7	340	39	20	?	—	—	—	47.3	67.7
Washington	Mar.	97.3	336	—	—	—	i 24	29	-60	e 54.9	—
Georgetown	—	97.3	336	—	—	—	e 24	26	-63	e 55.0	—
Cheltenham	N.	97.5	336	—	—	—	—	—	—	58.4	59.1
	E.	97.5	336	—	—	—	—	—	—	57.3	59.3
Melbourne	M.	101.3	131	24	56	? S	(24 56)	-72	—	64.1	67.1
Berkeley	—	101.8	11	—	—	—	—	—	—	e 49.7	—
Riverview	—	102.6	126	—	—	—	e 32	12	? SR ₁	48.8	51.5
Honolulu	M.	103.0	49	e 36	56	?	—	—	—	49.9	53.4
La Paz	Bi.	139.4	293	19	44	[- 6]	33	24?	?	68.9	80.2

Additional records : Lemberg gives $i = +8m.36s.$ Athens $PR_1N = +8m.54s.$,
 $PR_1E = -8m.56s.$, $PR_2N = -9m.19s.$, $SR_1 = -15m.25s.$ Zi-ka-wei $MN =$
 $-26.5m.$ Zagreb $eP = -8m.1s.$, $iPR_1 = +9m.11s.$, $iNE = +9m.47s.$,
 $iPS = +13m.38s.$, $iSR_1 = -17m.30s.$, $MNW = -26.3m.$ Pola $MN = 27.4m.$
De Bilt $SR_1N = +19m.8s.$, $eE = +19m.38s.$, $T_0 = 2h.35m.4s.$, epicentre
37.1N. 71.8E. Moncalieri $MN = -31.1m.$, $T_0 = 2h.35m.3s.$ Uccle
 $PR_1 = -10m.47s.$, $SR_1 = +19m.44s.$, $T_0 = 2h.35m.6s.$ Manila $MN =$
 $+20.4m.$ Osaka $MN = +32.7m.$, $T_0 = 2h.33m.14s.$ Paris $PR_1 =$
 $+11m.3s.$, $SR_1 = +19m.2s.$, $T_0 = 2h.35m.6s.$ Barcelona $PS = +17m.25s.$,
 $T_0 = 2h.35m.8s.$ Coimbra $LN = -28.9m.$, $T_0 = 2h.35m.15s.$ Ottawa
 $eLE = +39.7m.$, $L = +52.9m.$ and $+62.9m.$ Harvard $iN = +25m.36s.$,
 $eN = -37m.47s.$, $LN = +52.0m.$ Toronto $E = +46m.20s.$, $eL = +57.3m.$
and $+62.6m.$ Washington $L = +57.9m.$ Georgetown $LE = +58.1m.$,
 $LN = +58.6m.$ Riverview $e = +36m.56s.$, $MN = +51.7m.$ La Paz
 $PR_1 = +23m.18s.$

Dec. 1d. Records also at 1h. (Manila), 3h. (Ootomari and Manila), 5h. (Harvard),
7h. (La Paz), 9h. (Besançon), 10h. (Stonyhurst and Manila), 13h. (Osaka),
16h. (La Paz), 17h. (La Paz (2)).

1918. Dec. 2d. 9h. 47m. 21s. Epicentre $10^{\circ}5N. 44^{\circ}2W.$

A = +.705, B = -.686, C = +.182 ; D = -.697, E = -.717 ;

G = +.131, H = -.127, K = -.983.

Station and Component.		Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
					M. S.	S.	M. S.	S.	M.	M.
Vieques	N.	B.O.	21.9	293	5 29	+25	9 31	+28	—	10.9
	E.	B.O.	21.9	293	5 23	+19	9 31	+28	—	10.5
Rio de Janeiro	N.	B.O.	33.4	179	8 51	? PR ₁	12 45	+15	14.0	19.4
	E.	B.O.	33.4	179	8 51	? PR ₁	12 33	+ 3	13.8	17.0
Balboa Heights	N.	B.O.	34.9	270	7 25	+13	—	—	—	—
La Paz		Bi.	35.9	222	i 7 22	+ 1	13 5	—	17.8	20.1
La Quiaca	E.	M.	38.8	211	8 45	+61	—	—	21.3	29.8
	N.	M.	38.8	211	8 39	+55	—	—	21.2	23.6
Harvard	E.	B.O.	39.6	328	8 0	+ 9	14 0	0	e 17.0	—
	N.	B.O.	39.6	328	8 3	+12	13 35	-25	—	—
Cheltenham	N.	B.O.	40.6	320	8 15	+15	14 25	+10	—	14.6
	E.	B.O.	40.6	320	8 15	+15	14 34	+19	—	20.0
Georgetown	E.		40.8	320	8 0	- 1	14 18	0	e 19.6	—
	Z.		40.8	320	e 8 8	+ 7	—	—	e 19.4	—
Washington		Mar.	40.8	320	i 8 0	- 1	14 14	- 4	18.3	—
Northfield		B.O.	41.7	329	e 8 6	- 3	14 23	- 8	17.6	—
Ithaca	E.	B.O.	42.6	323	e 3 58	?	10 26	? PR ₁	15.8	—
	N.	B.O.	42.6	323	e 4 2	?	10 27	? PR ₁	15.7	16.6
San Fernando			43.0	48	8 3	-15	14 9	-39	22.6	24.6
Rio Tinto		M.	43.3	47	7 39	-41	—	—	—	28.6
Coimbra			43.4	42	E 7	-14	14 29	-25	19.1	19.7
Andalgala	E.	M.	43.7	210	14 39	? S	(14 39)	-19	23.4	28.0
	N.	M.	43.7	210	14 27	? S	(14 27)	-31	23.2	28.4
Ottawa			44.1	329	i 8 24	- 3	i 14 55	- 8	21.6	—
Toronto		M.	45.0	323	8 39	+ 6	i 15 33	+18	21.4	22.5
Mobile		W.	45.5	305	—	—	e 15 39	+18	—	—
Ann Arbor	E.	B.O.	46.9	320	8 39	- 7	15 33	- 7	22.4	23.8
	N.	B.O.	46.9	320	—	—	15 27	-13	22.6	23.6
	E.	W.	46.9	320	8 33	-13	15 27	-13	22.4	23.6
	N.	W.	46.9	320	8 39	- 7	15 27	-13	22.6	23.2
Tortosa			49.3	46	8 55	- 7	15 57	-13	21.9	23.9
St. Louis		W.	49.6	312	9 27	+23	e 16 21	+ 7	e 18.8	21.8
Algiers		B.M.	50.0	52	8 57	-10	16 2	-17	22.2	25.6
Barcelona			51.0	46	e 9 4	- 9	16 16	-15	e 22.5	26.4
Shide		M.S.	53.4	32	9 23	- 6	16 46	-15	—	27.2
Marseilles		Ma.	53.9	42	i 9 31	- 1	i 17 0	- 8	e 26.6	31.6
Bidston		M.S.	54.0	30	9 39	+ 6	17 3	- 6	—	27.2
Kew		M.	54.3	32	—	—	—	—	—	32.6
Paris			54.5	37	e 9 31	- 5	i 17 4	-11	24.6	27.6
Eskdalemuir		G.	55.1	28	9 36	- 4	17 14	- 8	26.6	—
Edinburgh		M.	55.5	28	9 39	- 4	—	—	—	31.2
Besancon			55.9	39	9 42	- 3	17 29	- 4	—	—
Moncalieri		S.	56.1	43	i 9 41	- 6	i 16 57	-38	23.2	31.3
Uccle			56.5	36	e 9 44	- 5	i 17 31	- 9	25.6	28.5
Milan		Ag.	57.3	43	10 54	+60	—	—	26.6	26.6
De Bilt	E.		57.5	35	9 55	- 1	17 52	- 1	26.6	26.9
	N.		57.5	35	9 56	0	—	—	23.6	26.1
Zurich			57.5	41	e 9 49	- 7	e 17 47	- 6	—	—
Rocca di Papa		Ag.	58.6	48	9 40	-23	18 1	- 5	e 27.2	33.6
Pompeii	E.	O.A.	59.6	49	i 10 19	+10	i 18 30	+12	28.8	35.8
Pola		W.	60.2	44	e 10 33	+20	e 17 3	-83	e 26.0	31.5
Zagreb	N.E.	W.	61.9	44	e 10 24	0	i 18 45	- 2	30.6	35.6
	N.W.	W.	61.9	44	e 10 27	+ 3	i 18 48	+ 1	—	31.6
Tucson	E.	B.O.	64.8	301	—	—	—	—	33.6	38.0
Athens			66.3	52	e 10 51	- 3	19 36	- 5	31.3	35.4
Lemberg		B.O.	68.1	41	e 11 9	+ 4	e 20 3	0	e 33.0	35.8
Helwan		M.	72.4	61	i 11 33	+ 1	—	—	—	45.2
Lick		W.	73.8	308	e 11 15	-26	—	—	—	—

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.		O-C.	S.	O-C.	L.	M.
				M.	S.	S.	M.	S.	M.	M.
Berkeley	—	74.2	309	e 13	54	+131	—	—	—	—
Cape Town	M.	74.2	130	14	3	+140	20	9	-67	35.4
Victoria	M.	75.0	319	20	9	? S	(20 9)	-77	34.6	50.6
Mauritius	N.	104.8	110	32	3	? SR ₁	—	—	48.4	54.4
	E.	104.8	110	26	57	? S	(26 57)	+17	50.6	55.0
Honolulu	M.	107.7	298	24	57	? S	28 33	+86	32.6	35.8
Simla	O.E.	110.2	49	e 28	3	? S	(e 28 3)	+33	56.4	58.0
Bombay	O.E.	111.4	63	18	34	? S	—	—	61.0	67.0
Kodaikanal	M.	118.4	70	31	21	? S	(31 21)	-164	61.0	71.6
Colombo	M.	121.6	75	25	51	? S	37 9	? SR ₁	56.4	78.4
Zi-ka-wei	—	136.1	14	e 21	9	? PR ₁	—	—	—	77.2
Manila	W.	150.9	31	e 20	9	[+12]	—	—	e 63.6	85.4
Batavia	W.	151.0	84	20	26	[+29]	—	—	e 75.6	77.6
Melbourne	M.	151.5	195	i 42	57	? SR ₁	—	—	—	84.0
Perth	M.	151.8	142	24	36	? PR ₁	—	—	—	—
Riverview	—	152.7	209	e 17	51	? S	e 34 5	+113	e 60.6	64.9

For La Quiaca it is assumed that standard time 4h. 0m. 0s. from Greenwich is used, in spite of the printed statement that Cordoba time (4h. 16m. 48s.) is used.

Additional records: Georgetown gives SN = +14m.17s. Northfield L = +33.6m. San Fernando MN = +24.2m., T₀ = 9h.47m.42s. Coimbra PR₁ = -9m.38s., iN = -14m.38s., iE = +14m.40s., LN = +17.7m., MN = +20.5m., T₀ = 9h.47m.25s. Andalgala PE = +18m.15s., Ottawa eL = +18.2m., L = +29.6m., and +44.6m., T₀ = 9h.47m.30s. Toronto L = +18.2m., T₀ = 9h.47m.18s. Ann Arbor T₀ = 9h.47m.24s. Eskdalemuir PR₁ = +11m.58s., PR₂ = +12m.42s. Besançon gives the records in the table as on the previous day. Moncalieri MN = +30.7m. Uccle PR₁ = -12m.39s., T₀ = 9h.47m.23s. De Bilt m = -17m.58s., eSR₁ = +21m.36s., T₀ = 9h.47m.23s. Epicentre 10° 5N. 44° 0W. Rocca di Papa MN = +37.2m. Pola MN = -30.6m. Zagreb iPNW = +10m.29s., iPNW = +10m.33s., eSNE = +18m.30s., iSR₁ = +22m.33s., T₀ = 9h.47m.42s. Athens LN = +32.0m., MN = +36.9m. Victoria S = +25m.9s. Honolulu eL = +60.2m., M = 65.0m., Zi-ka-wei MN = +79.3m. Manila MN = +87.0m. Riverview MN = +65.2m.

Dec. 2d. Records also at 0h. (Algiers), 3h. (La Paz and Perth), 6h. (Athens and Zagreb), 8h. (Manila), 10h. (Manila (2)), 11h. (Taihoku and Mizusawa), 12h. (Honolulu and Mizusawa), 14h. (Colombo and Denver), 22h. (San Fernando and La Paz).

Dec. 3d. 17h. 51m. 0s. Epicentre 10° 0S. 108° 0E.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia		4.0	343	e 1 0	- 2	—	—	—	5.0
Perth		23.1	163	—	—	9 29	+ 2	13.7	—
Manila		27.8	28	e 3 35	-151	—	—	5.0	—
Melbourne		43.3	136	13 0	+280	17 18	+146	19.4	19.6
Riverview		46.1	128	e 8 44	+ 3	e 15 22	- 7	e 17.2	19.1
Sydney		46.1	128	10 30	PR ₁	—	—	16.2	20.1
La Paz		153.2	188	18 14	?	—	—	—	—

Riverview gives PS = +16m.3s., MN = +17.7m.

Dec. 3d. 23h. 6m. 52s. Epicentre 16° 0N. 148° 0E.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	23.9	347	5 27	0	9 47	+ 5	—	—
	N.	23.9	347	5 28	+ 1	9 42	0	—	—
Manila		26.2	271	e 5 54	+ 4	—	—	—	—
Zi-ka-wei		28.6	307	e 6 8	- 6	—	—	—	—
Honolulu		51.1	75	—	—	—	—	e 24.3	32.6

Dec. 3d. Records also at 4h. (Andalgala), 6h. (Colombo), 8h. (La Paz), 12h. (Bidston, Accra, and Manila), 17h. (Tokyo), 20h. (Colombo), 22h. (La Paz and San Fernando), 23h. (La Paz).

1918. Dec. 4d. 11h. 47m. 44s. Epicentre 26° 5S. 70° 5W.

A = +.299, B = -.844, C = -.446; D = -.943, E = -.334;

G = -.149, H = +.421, K = -.895.

Compare with 1918 May 20d., Epicentre 29° 6S., 71° 5W. This main shock was apparently followed by a long series of repetitions, chiefly recorded only at La Paz. See note at end of this bulletin.

Station and Component.	Machine.	Z.	Azimuth.	P.		O. C.		S.		O. C.		L.		M.	
				M.	S.	S.		M.	S.	S.		M.		M.	
Andalgala	M.	3.9	107	0	28	-33		1	10	-37		1.2		4.6	
La Quiaca	E.	6.1	46	2	4	+31						3.1		4.8	
	N.	6.1	46	1	58	-25						3.1		4.5	
La Paz	Bi.	10.2	13	i	2	22	11	4	30	-5		5.0		6.3	
Cipolletti	M.	12.6	171	3	52	-45		5	52	+18		5.9		6.9	
Balboa Hts.	E.	36.5	348	7	24	-2						14.0		16.4	
	N.	36.5	348	7	32	6						14.4		26.2	
Vieques	N.	44.9	7	8	15	-17		16	8	+54		24.6		31.3	
	E.	44.9	7	8	28	-4		22	46	? 1.		26.8		26.8	
Tacubaya		53.7	326	9	18	-13								30.0	
Ascension	M.	56.3	82	9	23	-25		16	46	-52					
Mobile	W.	59.6	346	e	10	6	3	18	1	-17					
Cheltenham	N.	65.5	355	10	46	2		20	13	-42		38.0		42.4	
	E.	65.5	355	10	46	-2		19	16	-15		40.9		42.8	
Georgetown	E.	65.7	354	10	38	-11		19	23	-10		e 30.0		32.2	
	N.	65.7	354	10	43	-6		19	23	-10				42.3	
Washington	Mar.	65.7	354	10	40	-9		19	11	-22		41.3			
St. Louis	W.	67.7	346	i	10	58	-4	e	20	40	-42	31.3?			
Harvard	N.	68.9	0	10	51	-19		19	48	25		e 34.8		37.2	
	E.	68.9	0	11	9	-1		20	11	2				41.0	
Ithaca	N.	69.1	355	e	12	3	+51	e	20	59	-44			46.4	
	E.	69.1	355	e	12	41	+89	e	21	6	-51			46.6	
Lawrence	E.	69.4	340	e	10	57	-16	e	20	7	-12	28.6		29.2	
	N.	69.4	340					19	59	-20		29.2		29.4	
Ann Arbor	E.	69.9	351	10	46	-30		19	34	-51		30.9		32.3	
	N.	69.9	351	10	40	-36		20	4	-21		30.7		40.3	
	E.	69.9	351	10	52	-24		19	34	-51		31.0		32.3	
	N.	69.9	351	10	46	-30		20	4	-21		31.3		40.3	
Tucson	N.	70.2	324	10	16	-62		20	38	-10		36.3		38.8	
	E.	70.2	324	11	39	+21						28.3		38.8	
Toronto	M.	70.6	353	e	11	52	+31	i	21	4	+31	31.9		51.2	
Northfield	B.O.	70.7	359	11	10	-11		20	21	-13		e 28.6			
Ottawa		72.1	356	e	11	20	-11	e	20	40	-11	e 31.6			
Cape Town	M.	74.8	121	9	46	?		12	16	? P		21.8		40.1	
Lick	W.	79.7	322	e	12	20	3	e	22	14	-6			43.8	
Berkeley	N.	80.5	322	e	12	16	-6	e	22	16	-13			42.2	
	E.	80.5	322	e	12	20	-2	e	22	36?	+7			44.8	
San Fernando		87.3	47	13	4	+3		24	16	+32		43.3		55.3	
Rio Tinto	M.	87.8	45	12	16	-48								52.3	
Coimbra		88.2	42	13	3	-3		23	45	-9		39.4		44.8	
Victoria	M.	88.6	328	13	12	+4		23	48	-11		41.1		55.2	
	Z.	88.6	328	13	0	-8		22	56	-63		41.3		53.3	
Algiers	B.M.	93.7	50	e	13	15	-21	24	2	-51		35.3		43.3	
Apia	W.	93.7	257	13	39	3		24	10	43		43.9		47.3	
Tortosa		93.8	46	13	20	-17		24	2	-52		41.0		55.3	
Barcelona		95.5	46	e	13	35	-11	24	23	-48		37.6		46.2	
Honolulu	M.	97.3	290	15	40	+104		25	28	-1		46.0		53.6	
Shide	M.S.	98.3	37	14	43	+41		24	16	83		40.4		53.8	
Marseilles	Ma.	98.5	46	13	56	-7		25	5	-36		50.3		59.3	
Bidston	M.S.	98.8	34	14	58	+54		26	28	+44				51.9	
West Bromwich		98.9	35					24	37	-68					
Kew	M.	99.2	36											62.3	
Paris		99.4	40	e	14	41	+34	e	24	31	-79	44.3		49.3	
Stonyhurst	M.	99.4	35	i	28	40?	?	i	36	40	?	i 53.7		62.3	

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Sitka	B.O.	99.6	330	—	—	—	—	e 68.3	73.3
Eskdalemuir	G.	99.8	32	14 17	- 7	26 22	+28	—	—
Edinburgh	M.	100.1	32	13 46	-25	—	—	—	57.3
Besancon	—	100.7	42	—	—	28 4	-122	—	—
Moncalieri	S.	100.8	45	e 13 22	-52	23 39	-144	36.7	—
Uccle	—	101.4	38	e 13 52	-25	e 24 40	-89	43.3	53.0
Dyce	Ma.	101.4	31	—	—	19 12	? PR ₁	29.5	47.8
Milan	—	101.9	46	14 1	-19	—	—	48.3	88.0
Zurich	—	102.3	43	e 14 10	-12	e 28 23	+125	e 51.3	—
De Bilt	E.	102.5	38	e 14 30	+ 7	25 43	—	e 44.3	51.0
	N.	102.5	38	e 14 41	-18	25 44	-36	—	47.8
	—	102.6	49	e 13 46	-37	e 24 52	-88	44.5	60.0
Rocca di Papa	Ag.	102.6	49	e 13 46	-37	e 24 52	-88	44.5	60.0
Pompeii	O.A.	103.4	51	e 17 17	?	e 28 16	-108	36.3	61.3
Pola	W.	104.6	47	18 31	? PR ₁	e 25 11	-87	25.2	49.3
Zagreb	N.W.	106.4	47	e 14 15	-26	i 25 16	-100	48.3	63.3
	N.E.	106.4	47	e 14 5	-36	i 25 1	-115	—	61.3
Melbourne	—	107.7	209	19 52	? PR ₁	25 34	-93	30.3	31.6
Sydney	M.	107.9	216	14 52	- 4	25 40	-89	45.8	55.5
Riverview	—	108.0	215	e 15 28	+40	25 6	-124	e 46.1	56.3
Budapest	—	108.9	45	8 30	?	19 10	? PR ₁	—	—
Athens	N.	109.2	56	e 13 43	71	e 25 32	-109	e 48.4	63.0
	E.	109.2	56	—	—	e 25 30	-111	e 48.2	56.9
Mauritius	N.	111.7	128	19 22	? PR ₁	27 22	-21	29.3	56.2
	E.	111.7	128	19 52	? PR ₁	26 46	-57	29.6	57.2
Helwan	—	112.4	67	15 28	+19	20 40	? PR ₁	—	71.2
Adelaide	M.	112.8	206	26 24	? S	34 44	? SR ₁	51.2	57.7
Lemberg	B.O.	112.8	44	e 19 34	? PR ₁	e 26 28	-84	e 29.9	43.5
Perth	M.	121.3	186	21 32	? PR ₁	37 20	? SR ₁	60.0	74.0
Bombay	O.E.	145.4	93	19 33	-16	34 19	? SR ₁	—	76.2
Colombo	M.	145.6	119	20 22	+33	—	—	78.1	89.5
Kodaikanal	M.	145.6	112	20 34	+45	—	—	73.0	90.4
Ootomari	O.	146.9	317	20 2	+11	—	—	—	—
Batavia	W.	147.2	175	e 20 2	+11	i 21 7	?	48.3	65.3
Mizusawa	E.	150.8	304	19 59	+ 2	42 48	? SR ₁	—	—
	N.	150.8	304	20 1	- 4	42 54	? SR ₁	—	—
Simla	O.E.	151.4	73	e 19 52	6	—	—	e 70.0	70.6
Tokyo	O.	152.6	297	20 10	+10	30 38	?	46.1	—
Osaka	O.	156.3	296	20 45	-41	39 53	?	58.7	76.4
Kobe	O.	156.5	297	e 20 20	+16	—	—	—	47.9
Calcutta	E.	160.4	97	20 22	+14	—	—	88.4	92.6
	N.	160.4	97	20 16	- 8	—	—	89.3	103.3
Manila	W.	164.0	224	20 20	+ 9	e 36 36	?	e 77.5	81.5
Zi-ka-wei	—	168.6	297	e 20 32	+18	e 32 6	?	e 52.4	84.0
Taihoku	O.	169.1	265	21 25	-71	—	—	47.1	48.5

For La Quiaca it has been assumed (in spite of the printed statement that Cordoba time is used, which implies an addition of 4h.16m.48s.) that standard time 4h. from Greenwich is really used: i.e., the addition is only 4h.0m.0s. Additional records: La Paz i = +4m.48s., T₀ = 11h.47m.29s. Epicentre 26.5S. 70.5W. Mobile PR₁ = +12m.36s. Washington L = +28.3m. and +56.3m. St. Louis L = +28.3m. and +42.2m. Harvard T₀N = 11h.47m.37s., T₀E = 11h.47m.30s. Ithaca iE = +22m.1s. Lawrence eSE = +19m.59s. Northfield L = +46.3m. Ottawa L = +42.3m. and +48.3m., T₀ = 11h.47m.43s. Lick MN = +44.6m., T₀ = 11h.48m.8s. Berkley T₀ = 11h.47m.58s. Coimbra iN = +24m.11s., iE = +24m.21s., iN = +38.4m., MN = +43.3m., T₀ = 11h.48m.2s. Victoria gives also S = +23m.30s. Apia e₂ = +17m.24s., i₂ = +26m.28s., i₃ = +30m.40s. Barcelona PR₁ = +17m.58s., PS = +25m.26s., T₀ = 11h.48m.28s. San-Fernando MN = +54.3m., T₀ = 11h.47m.31s. Paris PR₁ = +18m.34s., eSN = +34m.38s. Eskdalemuir PR₁ = +18m.35s., T₀ = 11h.47m.44s. Uccle PR₁ = +17m.46s., i = +28m.5s., T₀ = 11h.48m.42s. De Bilt PR₁ = +19m.5s., e = +28m.15s., m = +28m.28s., Epicentre 26.5S. 70.5W. Rocca di Papa eL = +28.5m., MN = +62.3m. Zagreb i = +16m.39s., +18m.45s. and 19m.43s., T₀ = 7h.48m.57s. Sydney PS = +25m.16s., SR₁ = +34m.16s. Riverview PS = +26m.11s., i = +29m.10s., e = +34m.19s. and +35m.33s., MN = +46.5m., MZ = +51.6m. Athens PR₁ = +19m.10s., PSE = +26m.11s., iE = +29m.20s., T₀ = 11h.47m.29s. Adelaide PR₁ = +28m.48s., SR₁ = +39m.44s. Perth PR₁ = +31m.26s., SR₁ = +43m.45s. Osaka MN = +96.9m. Kobe MN = +47.8m. Manila iE = +22m.20s., iN = +23m.19s., MN = +81.8m. Zi-ka-wei SR₁N = +47m.10s., SR₁E = +48m.38s., MN = +87.1m.

Dec. 4d. 17h. 41m. 40s. Epicentre $26^{\circ}5S$. $70^{\circ}5W$. (as at 11h.).

A = +.299, B = -.844, C = -.446 ; D = -.943, E = -.334 ;
G = -.149, H = +.421, K = -.895.

For note on other repetitions see note at end of this bulletin.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Andalgala	N.	3.9	107	0 20	-41	(1 8)	-39	1.1	1.7
La Quiaca	E.	6.1	46	0 14	-79	(1 44)	-62	1.7	4.3
	N.	6.1	46	0 20	-73	(1 38)	-68	1.6	2.7
La Paz		10.2	13	2 30	-3	4 38	+3	5.7	6.3
Cipolletti		12.6	171	2 38	-29	(3 50)	-104	3.8	5.6
Harvard		68.9	0	—	—	—	—	34.4	—
Toronto		70.6	353	—	—	—	—	e 40.5	41.5
Capetown		74.8	121	21 20	?S	(21 20)	-4	—	46.8
San Fernando		87.3	47	53 20	?L	—	—	(53.3)	57.3
Rio Tinto		87.8	45	13 20	+16	—	—	—	54.3
Coimbra		88.2	42	23 33	?S	(23 33)	-21	e 46.4	—
Algiers		93.7	50	—	—	—	—	e 39.7	57.3
Bidston		98.8	34	27 32	?S	(27 32)	+108	—	46.6
Paris		99.4	40	—	—	—	—	e 55.3	63.3
Edinburgh		100.1	32	53 20	?L	—	—	(53.3)	63.3
De Bilt		102.5	38	—	—	e 27 22	-62	e 55.3	56.0
Riverview		108.0	215	—	—	e 48 40	?	e 52.6	58.1
Colombo		145.6	119	80 20	?L	—	—	(80.3)	91.8
Kodaikanal		145.6	112	83 2	?L	—	—	(83.0)	—
Manila		164.0	224	e 20 20	[+9]	—	—	—	—

For La Quiaca it is assumed that standard time 4h. 0m. 0s. from Greenwich is used, not Cordoba time (4h.16m.48s.) as printed.

Additional records: La Paz gives $T_0=17h.41m.33s.$ Harvard LN = +37.5m. San Fernando PN = +52m.20s., MN = +55.3m.

Dec. 4d. Records also at 0h. (Rocca di Papa and Victoria), 1h. (Mizusawa and Helwan), 2h. (Zagreb), 3h. (Simla), 4h. (Manila and La Paz), 7h. (Kodaikanal), 9h. (Mizusawa), 11h. (Denver), 12h. (Batavia and Melbourne), 13h. (St. Louis, Andalgala, La Quiaca, and La Paz (3)), 14h. (Batavia and La Paz), 15h. (La Quiaca, La Paz (3), and Balboa Heights), 16h. (La Paz (3)), 17h. (La Paz, Rocca di Papa, and Balboa Heights), 18h. (La Paz, Victoria, and Rocca di Papa), 19h. (Rocca di Papa, La Paz (3), and Athens), 20h. (La Paz (5)), 21h. (La Paz and Batavia), 23h. (La Paz (2) and Helwan).

Dec. 5d. Records at 1h. (Cipolletti, La Quiaca, La Paz (3), Andalgala, and San Fernando), 2h. (Rocca di Papa), 5h. (La Paz (3)), 7h. (La Paz (3)), 8h. (La Paz), 9h. (La Paz and Manila), 12h. (La Paz (2), Cipolletti, and Dehra Dun), 13h. and 14h. (La Paz), 18h. (La Paz (2), Helwan, and Tortosa), 19h. (Barcelona and La Paz), 20h. (La Paz (2), Athens, and Cipolletti (2)), 21h. (Pa Paz, Helwan, and San Fernando), 22h. (La Paz (2), Pilar, La Quiaca, and Andalgala), 23h. (La Paz, Helwan, and Edinburgh).

Dec. 6d. 7h. 21m. 52s. Epicentre $26^{\circ}5S$. $70^{\circ}5W$. (as on 1918 Dec. 4d.).

A = +.299, B = -.844, C = -.446 ; D = -.943, E = -.334 ;
G = -.149, H = +.421, H = -.895.

For note on other repetitions see note at end of this bulletin.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Andalgala		3.9	107	28 56	?	—	—	29.3	31.3
Pilar	E.	7.8	133	1 56	-2	(3 20)	-11	3.3	4.9
	N.	7.8	133	1 56	-2	(3 26)	-5	3.4	4.7
La Paz		10.2	13	2 31	-2	4 38	+3	5.1	5.7
Cipolletti		12.6	171	4 20	+73	(5 20)	-14	5.3	7.1
Georgetown		65.7	354	—	—	e 19 18	-15	—	—
Toronto		70.6	353	—	—	—	—	25.5	—
Ottawa		72.1	356	—	—	i 20 36	-15	e 43.9	—
Capetown		74.8	121	22 38	?S	(22 38)	+74	—	45.1
San Fernando		87.3	47	23 8	?S	(23 8)	-36	(49.2)	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Coimbra	88.2	42	e 40 45	?L	—	—	52.3	—
Victoria	88.6	328	42 26	?L	—	—	(42.4)	50.5
Algiers	93.7	50	—	—	e 23 40	-73	46.1	—
Honolulu	97.3	290	—	—	e 31 20	?SR ₁	45.3	52.1
Paris	99.4	40	—	—	e 48 8	?L	54.1	62.1
Edinburgh	100.1	32	29 8	?SR ₁	—	—	—	118.1
Uccle	101.4	38	—	—	—	—	—	58.1
De Bilt	102.5	38	—	—	e 27 23	+63	e 51.1	52.3
Rocca di Papa	102.6	49	—	—	e 24 14	-126	e 51.6	65.3
Graz	106.5	46	e 24 50	?S	(e 24 50)	-127	—	—
Mauritius	111.7	128	53 14	?L	—	—	(53.2)	—
Colombo	145.6	119	82 8	?L	—	—	(82.1)	88.1
Kodaikanal	145.6	112	81 26	?L	—	—	(81.4)	—
Batavia	147.2	175	e 20 8	[+17]	—	—	—	22.1
Manila	164.0	224	e 20 8	[-3]	—	—	—	—
Taihoku	169.1	265	e 78 8	?L	—	—	(e 78.1)	—

Additional records: Andalgalá gives a set of North component records, but these, like the other set, are difficult to understand. The time correction is probably not the right one to apply in reducing to G.M.T. La Paz gives $T_0 = 7h.21m.47s.$ Mauritius $P.N. = +54m.26s.$

1918. Dec. 6d. 8h. 41m. 3s. Epicentre $49^{\circ}0N. 124^{\circ}0W.$

A = -367, B = -544, C = +755; D = -829, E = +559;
G = -422, H = -626, K = -656.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
Victoria	M.	0.8	141	0 36	-24	—	—	1.4	2.2
	Z.	—	0.8	141	0 41	+29	—	1.4	1.6
Sitka	E.	B.O.	10.5	324	2 12	-25	e 4 7	4.5	5.2
	N.	B.O.	10.5	324	e 2 20	-17	e 4 9	4.6	5.7
Berkeley	E.	—	11.2	173	e 2 58	+11	5 19	e 6.5	9.6
	N.	—	11.2	173	e 2 58	+11	5 18	+19	i 5.7
Saskatoon	Ma.	12.0	69	3 2	+ 3	5 35	+16	6.6	—
Lick	E.	W.	12.1	171	e 3 9	+ 9	e 5 47	e 6.8	7.2
	N.	W.	12.1	171	e 3 8	+ 8	i 5 41	+26	e 6.9
	Z.	W.	12.1	171	e 3 8	+ 8	e 5 42	+21	e 6.8
Denver	W.	16.4	117	1 57	?	—	—	8.0	9.0
Tucson	E.	B.O.	19.4	145	4 49	+15	8 50	+40	10.2
	N.	B.O.	19.4	145	5 47	+73	9 52	+102	13.1
Lawrence	E.	W.	22.8	105	5 21	+ 6	9 46	+25	12.9
	N.	W.	22.8	105	5 23	+ 8	9 48	+27	13.0
St. Louis	E.	W.	26.2	101	i 5 57	+ 7	e 10 45	+19	14.8
	N.	W.	26.2	101	—	—	10 57	+31	14.6
Aun Arbor	E.	B.O.	28.6	88	5 27	-47	10 33	-37	12.8
	N.	B.O.	28.6	88	5 21	-53	10 27	-43	12.6
Toronto	M.	30.8	82	6 51	+15	12 9	+21	14.0	20.4
Ottawa	—	32.5	78	6 47	- 6	12 13	- 3	e 14.0	19.0
Mobile	E.	W.	32.6	110	e 6 47	- 6	i 12 25	+ 7	20.0
	N.	W.	32.6	110	—	—	—	19.8	20.3
Ithaca	E.	B.O.	33.2	82	7 30	+32	e 13 0	+33	—
	N.	B.O.	33.2	82	7 32	+34	e 12 59	+32	—
Georgetown	E.	—	34.7	89	i 7 8	- 3	12 54	+ 3	e 16.4
	Z.	—	34.7	89	7 51	+40	12 26	-25	e 15.4
Washington	Mar.	34.7	89	i 7 7	- 4	12 51	0	16.6	20.9
Northfield	B.O.	34.8	78	6 54	-17	12 52	0	18.0	—
Cheltenham	N.	B.O.	34.9	89	7 12	0	13 0	+ 6	17.6
	E.	B.O.	34.9	89	7 15	+ 3	13 3	+ 9	19.0
Tacubaya	—	35.7	137	7 0	-19	—	—	—	24.8
Harvard	B.O.	36.8	80	i 7 4	-24	12 47	-34	e 18.7	21.0
Honolulu	M.	38.6	236	e 7 21	-22	e 13 3	-43	e 17.4	22.0
Halifax	—	39.9	72	7 52	- 2	14 10	+ 5	—	—
Balboa Heights	B.O.	54.6	121	9 57	+20	—	—	—	—

Continued on next page.

Station and Component.		Machine.	Δ	Azimuth.	P.		O-C.	S.	O-C.	L.	M.	
			$^{\circ}$	$^{\circ}$	M.	S.	S.	M.	S.	M.	M.	
Vieques	N.	B.O.	55.9	101	10	29	+44	18	5	+32	28.8	35.0
	E.	B.O.	55.9	101	—	—	—	17	59	+26	28.1	35.5
Dyce		Ma.	63.0	30	10	45	+13	i 19	45	+44	32.8	39.0
Eskdalemuir		G.	65.7	32	10	55	+6	i 19	29	-4	31.4	35.8
Bidston		M.S.	66.1	35	11	39	+47	20	9	+31	—	42.0
Kew		M.	68.7	35	—	—	—	—	—	—	—	44.0
Shide		M.S.	68.9	35	10	22	-48	20	11	-2	34.8	41.4
De Bilt		—	70.1	29	11	24	+6	20	37	+10	e 35.0	36.8
Osaka		O.	70.7	301	11	15	-6	—	—	—	—	—
Uccle		—	70.9	31	e 11	23	+1	—	—	—	e 34.0	41.0
Paris		—	71.9	34	—	—	—	e 19	57	-52	30.0	55.0
Coimbra		—	74.3	45	21	22	? S	(21 22)	+4	—	37.1	39.9
Moncalieri		S.	77.0	32	e 9	25	?	21	57	+8	36.1	48.3
Lemberg		B.O.	77.4	20	—	—	—	e 21	51	-2	42.0	51.8
Marseilles		Ma.	77.6	35	—	—	—	—	—	—	e 40.8	—
Tortosa		—	77.8	40	12	12	+6	21	55	-3	33.1	47.7
Barcelona		—	77.9	38	—	—	—	e 22	22	+23	e 33.1	47.0
San Fernando		—	78.4	47	—	—	—	—	—	—	40.0	46.0
Zi-ka-wei		—	80.9	310	—	—	—	e 22	8	-26	—	—
Rocca di Papa		Ag.	81.6	30	e 12	27	-1	e 22	37	-5	e 40.6	53.6
La Paz		Bl.	82.1	129	e 12	33	+2	i 22	54	+7	38.6	41.3
Monte Cassino		—	82.2	30	12	37	+6	—	—	—	—	—
Algiers		B.M.	82.3	40	12	25	-7	22	49	0	43.0	47.4
Pompeii		O.A.	83.2	29	e 13	46	+69	e 19	0	-239	44.5	49.3
Manila		W.	94.5	299	e 12	57	-44	—	—	—	—	—
Simla		O.E.	97.7	341	10	21	?	—	—	—	—	49.6
Cipolletti		M.	100.9	140	—	—	—	—	—	—	53.0	64.0
Bombay		O.E.	110.5	342	—	—	—	—	—	—	—	63.2
Riverview		—	111.8	244	—	—	—	e 26	39	-65	46.1	52.2
Kodaikanal		M.	117.9	337	2	15	?	—	—	—	—	—
Melbourne		M.	118.2	245	—	—	—	—	—	—	61.4	69.0
Colombo		M.	120.3	333	2	57	?	—	—	—	—	78.0
Perth		M.	132.8	270	—	—	—	38	17	? SR ₁	—	—
Cape Town		M.	148.5	76	65	27	? L.	—	—	—	(65.4)	89.0
Mauritius	E.	M.	151.0	356	77	27	? L.	—	—	—	(77.4)	97.8
	N.	M.	151.0	356	72	51	? L.	—	—	—	(72.8)	85.0

Additional records : Berkeley eLN? = +7.1m., T₀ = 8h.41m.8s. Saskatoon T₀ = 8h.40m.56s. Lick T₀ = 8h.41m.2s. Ann Arbor T₀ = 8h.40m.42s. Toronto e = +9m.15s., iL = +17.0m., T₀ = 8h.41m.12s. Epicentre 49° 32' N. 127° 0' W. Mobile SR₁ = +18m.17s. Ithaca M = +19.5m. Harvard eLE = +20.2m., T₀ = 8h.40m.54s. Halifax T₀ = 8h.40m.57s. Eskdalemuir M = +36.5m., T₀ = 8h.41m.25s. De Bilt MN = +37.2m., T₀ = 8h.41m.13s. Graz T₀ = 8h.41m.23s. Paris MN = +48.0m. Coimbra MN = +41.0m. Marseilles a record at +55m.49s. Riverview eSR₁ = +34m.39s., MN = +54.1m. Colombo M = +9.0m. This may be 1h. in error, but the observations at Simla, Kodaikanal, and Colombo may refer to another shock in India. For note on other repetitions see note at end of this bulletin.

Dec. 6d. 11h. 27m. 40s. At 26° 5S. 70° 5W. (as at 7h. 21m.).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Andalgala	E.	3.9	107	1	38	+37	—	2.5	3.5
La Quiaca		6.1	46	0	50	-43	—	1.5	2.1
Pilar		7.8	133	4	56	? S	(4 56)	5.6	6.6
La Paz		10.2	13	2	35	+2	—	7.7	8.7
Cipolletti		12.6	171	7	8	?	—	7.4	10.4

Andalgala gives also MN = +3.0m. For La Quiaca standard time 4h.0m.0s. has been assumed, as on Dec. 4d. 11h. and 17h., etc. Pilar LN = +5.4m., MN = +6.1m.

Dec. 6d. 12h. 3m. 0s. Epicentre 49°·0N. 124°·0W. (as at 8h.).

(Some of the more distinct observations may refer to another shock near Cheltenham).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria		0·8	141	-0 9	-21	0 21	-1	—	1·3
	Z.	0·8	141	0 32	+20	1 8	+46	—	1·4
Sitka	E.	10·5	324	e 4 9	?S	(e 4 9)	-34	e 4·8	—
	N.	10·5	324	e 4 24	?S	(e 4 24)	-19	e 5·0	—
Berkeley		11·2	173	e 3 5	+18	—	—	—	—
Lick		12·1	171	e 2 12	-48	—	—	—	—
Lawrence	E.	22·8	105	5 17	+2	9 48	+27	12·9	—
	N.	22·8	105	5 19	+4	9 52	+31	13·0	—
St. Louis		26·2	101	7 54	+124	—	—	e 14·6	—
Ann Arbor		28·6	88	—	—	12 0	+50	15·5	16·0
Toronto		30·8	82	—	—	—	—	15·5	18·7
Ottawa		32·5	78	e 10 44	+231	12 0	-16	e 16·6	19·0
Mobile		32·6	110	—	—	—	—	e 18·3	—
Ithaca		33·2	82	—	—	—	—	e 16·0	19·3
Washington		34·7	89	—	—	—	—	e 17·0	19·7
Georgetown	E.	34·7	89	e 10 45	?S	18 34	?L	(18·6)	—
	N.	34·7	89	e 11 29	?S	18 34	?L	(18·6)	—
Northfield		34·8	78	—	—	—	—	18·0	—
Cheltenham		34·9	89	18 28	?L	19 40	?	22·0	22·8
Tacubaya		35·7	137	17 57	?L	—	—	(18·0)	18·8
Harvard	N.	36·8	80	e 15 43	?SR ₁	—	—	e 19·3	—
	E.	36·8	80	19 14	?L	—	—	20·9	21·2
De Bilt		70·1	29	—	—	e 24 12	?SR ₁	e 37·0	38·9

Additional records: St. Louis iE = +14m.48s., eE = +17m.12s. Ithaca
LE = +21·7m. Georgetown i = +9m.21s. Cheltenham PE? = +19m.8s.

Dec. 6d. Records also at 0h. (La Paz), 4h. (La Paz), 6h. (Colombo and Rio Tinto), 8h. (Zagreb), 10h. (La Paz and Taihoku), 11h. (Rocca di Papa and Honolulu), 16h. (Zi-ka-wei), 21h. (Manila (2) and San Fernando), 22h. (Mizusawa), 23h. (La Paz).

Dec. 7d. 12h. 39m. 35s. Epicentre 26°·5S. 70°·5W. (as on Dec. 6d. 11h., etc.).

A = +·299, B = -·844, C = -·446.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Andalgala	E.	3·9	107	0 55	-6	—	—	1·7	2·2
	N.	3·9	107	1 7	+6	—	—	—	1·9
La Quiaca		6·1	46	1 31	-2	(2 7)	-39	2·1	2·6
Pilar		7·8	133	—	—	—	—	4·5	5·4
La Paz		10·2	13	2 30	-3	4 41	+6	5·4	6·3
Cipolletti		12·6	171	6 37	?L	—	—	7·3	7·8
Edinburgh		100·1	32	30 25	?SR ₁	—	—	—	—
Helwan		112·4	67	66 25	?L	—	—	(66·4)	—

For La Quiaca standard time for 4h.0m.0s. west of Greenwich has been assumed as on previous days.

Dec. 7d. Records also at 1h. (Riverview), 8h. (Helwan), 12h. (Manila), 19h. (La Paz), 22h. (Manila, Lick, and Colombo), 23h. (Batavia).

Dec. 8d. Records at 0h. (San Fernando), 1h. (Eskdalemuir), 4h. (Helwan), 9h. (Taihoku, La Paz, and Copolletti), 10h. (Helwan and Edinburgh), 12h. (Andalgala), 18h. (Athens), 19h. (Melbourne), 20h. (Helwan), 23h. (Batavia).

Dec. 9d. 1h. 12m. 30s. Epicentre $46^{\circ}7'N$. $145^{\circ}8'E$.

$$A = -.567, B = +.386, C = +.728; \quad D = +.562, E = +.827; \\ G = -.602, H = +.409, K = -.686.$$

Compare with 1918 May 31d., $45^{\circ}1'N$. $147^{\circ}2'E$. The evidence is against identity of the two.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	8.3	206	2 4	- 2	3 45	—	—	—
	N.	8.3	206	2 12	+ 6	3 47	+ 2	—	—
Zi-ka-wei		24.3	239	e 5 35	+ 4	—	—	—	—
Honolulu		51.7	99	—	—	—	—	e 26.1	30.5
De Bilt		75.6	336	—	—	—	—	e 43.5	44.0
Graz		76.6	328	11 54	- 5	—	—	—	—
Rocca di Papa		82.2	326	e 12 23	- 8	—	—	—	12.7
Helwan		83.4	308	51 30	?L	—	—	(51.5)	—

Additional records: De Bilt gives eLN = +44.5m. Rocca di Papa M = +14.4m.

Dec. 9d. 4h. 8m. 22s. Epicentre $5^{\circ}7'S$. $151^{\circ}8'E$.

$$A = -.877, B = +.470, C = -.099.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview		28.2	181	e 6 10	0	e 11 3	0	e 14.7	15.7
Manila		36.7	305	7 27	- 1	—	—	—	—
Perth		42.6	228	—	—	14 54	+11	—	—
Zi-ka-wei		46.9	324	e 8 43	- 3	e 15 47	+ 7	—	—
Honolulu		56.1	59	—	—	—	—	e 23.6	35.6
Victoria		90.8	41	43 25	?	48 20	?	55.8	57.2
Helwan		119.1	302	27 38	?	—	—	—	—
Toronto		121.3	40	—	—	—	—	e 72.2	75.0
De Bilt		126.1	335	—	—	—	—	e 64.6	66.1
Eskdalemuir		126.5	341	—	—	—	—	65.6	—
La Paz		134.7	121	19 43	[+14]	i 24 15	?PR ₁	—	—
Rocca di Papa		141.4	321	i 19 25	[-17]	—	—	—	—

Additional records: Riverview gives PR₁ = +7m.17s., iS = +11m.7s., PS = +11m.38s., MN = +15.6m., MZ = +17.4m.

Dec. 9d. 10h. 58m. 30s. Epicentre $26^{\circ}5'S$. $70^{\circ}5'W$. (as on Dec. 6d. 11h., etc.).

$$A = +.299, B = -.844, C = -.446.$$

But it seems doubtful whether the epicentre is really the same.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Andalgala		3.9	107	0 48	-13	(2 30)	+43	2.5	3.6
La Quiaca		6.1	46	4 0	+147	—	—	5.3	6.2
La Paz		10.2	13	3 34	+61	e 6 3	+88	6.8	7.6
Cipolletti		12.6	171	7 6	+239	—	—	7.6	8.6

Andalgala gives also PN = +1m.6s., LN = +1m.54s., MN = +2.6m. For La Quiaca standard time 4h.0m.0s. has been assumed as previously in December. But the residuals suggest some error (or series of errors) of whole minutes at one or more of the stations.

1918. Dec. 9d. 18h. 3m. 45s. (I) }
 18h. 52m. 47s. (II) } Epicentre 52° 0N. 178° 0W.

A = -0615, B = -0021, C = +0788; D = -0035, E = +0999;
 G = -0788, H = -0028, K = -0616.

These are reduced with the same epicentre for convenience of reference, but the residuals indicate that the second shock was nearer Manila (and Victoria?) and further from De Bilt, Graz, and Zagreb. If so, further south.

Station and Component.	Machine.	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
				M. S.	S.	M. S.	S.	M.	M.
(II) Tokyo	O.	33.9	259	e 8 12	+68	16 58	? 1.	(17.0)	—
(I) Honolulu	M.	34.4	146	e 12 33	? S	(e 12 33)	-13	e 17.9	21.2
(II) Victoria	M.	34.4	146	e 8 13	? PR ₁	i 14 1	? SR ₁	19.2	23.2
(I) Kobe	M.	34.4	76	6 19	-49	(12 13)	-33	12.2	21.6
(II) Berkeley	M.	34.4	76	—	—	(11 54)	-52	11.9	23.8
(I) Zi-ka-wei	O.	37.3	262	(e 7 20)	-12	(13 13)	-15	13.2	18.4
(I) Tucson	—	40.8	90	—	—	—	—	e 19.8	—
(I) Taihoku	—	48.2	271	e 8 36	-19	e 15 28	-28	—	—
(II) St. Louis	—	48.2	271	e 8 52	-3	e 15 50	-6	—	—
(I) Ann Arbor	E. B.O.	51.5	85	28 33	? 1.	—	—	(28.6)	53.4
(I) Manila	O.	52.5	265	e 6 15	?	—	—	—	—
(I) Toronto	W.	59.3	67	—	—	e 18 15	0	e 31.8	—
(I) Ottawa	W.	59.3	67	i 10 13	+ 6	e 18 22	+ 7	33.2	—
(I) Edinburgh	E. B.O.	60.2	59	—	—	28 51	?	33.2	37.2
(I) Graz	N. B.O.	60.2	59	—	—	28 45	?	32.2	36.2
(I) Budapest	E. W.	60.2	59	—	—	28 33	?	31.6	36.7
(I) Bidston	E. B.O.	60.2	59	—	—	—	—	31.2	35.2
(I) De Bilt	E. W.	60.2	59	—	—	—	—	29.2	34.2
(I) Zagreb	W.	60.8	259	e 10 19	+ 1	—	—	—	—
(I) Kew	W.	60.8	259	e 10 3	-15	—	—	18.4	20.0
(I) Paris	M.	61.5	55	—	—	—	—	31.4	40.4
(I) Rome	M.	61.5	55	—	—	—	—	38.8	40.3
(I) Moscow	M.	62.0	51	—	—	e 26 45	?	e 31.8?	—
(I) Yokohama	—	62.0	51	—	—	—	—	32.2	—
(I) Ithaca	B.O.	63.8	54	—	—	—	—	e 36.2	—
(I) Georgetown	B.O.	63.8	54	19 13	? S	(19 13)	+ 2	e 34.5	—
(I) Washington	—	66.1	58	—	—	—	—	e 37.7	—
(I) Cheltenham	—	66.1	58	—	—	—	—	e 33.2	—
(I) Harvard	Mar.	66.1	58	10 47	- 5	e 37 15	? 1.	40.8	—
(I) Edinburgh	Mar.	66.1	58	—	—	24 49	? SR ₁	e 34.8	—
(I) Bidston	B.O.	66.4	59	—	—	—	—	41.1	44.2
(I) De Bilt	B.O.	66.4	59	—	—	—	—	35.6	44.4
(I) Zagreb	B.O.	66.5	50	e 17 15	?	—	—	e 30.3	41.3
(I) Kew	B.O.	66.5	50	e 27 41?	? SR ₁	—	—	e 31.2	38.6
(I) Paris	M.	72.0	3	21 15	? S	(21 15)	+25	—	—
(I) Rome	M.	72.0	3	—	—	—	—	—	53.7
(I) Moscow	G.	72.5	3	—	—	i 20 56	0	46.2	—
(I) Yokohama	M.S.	74.5	2	21 27	? S	(21 27)	+ 7	—	40.0
(I) De Bilt	—	75.8	357	e 12 9	+15	e 22 3	+28	e 38.2	39.9
(I) Zagreb	—	75.8	357	—	—	22 34	+59	e 38.2	39.9
(I) Kew	M.	76.5	2	—	—	—	—	—	53.2
(I) Paris	—	79.2	0	—	—	—	—	e 48.2	—
(I) Rome	—	79.2	0	—	—	—	—	—	55.2
(I) Moscow	—	79.5	350	—	—	—	—	46.2	—
(I) Yokohama	E. W.	80.2	352	e 12 15	- 5	22 15	-10	—	—
(I) De Bilt	W.	80.2	352	i 12 27	+ 7	22 44	+19	—	—
(I) Zagreb	W.	81.4	351	12 21	- 6	e 22 32	- 7	48.2	55.2
(I) Kew	W.	81.4	351	12 35	+ 8	22 53	+14	48.2	57.2
(I) Rome	S.	82.9	357	—	—	—	—	53.3	—
(I) Moscow	W.	85.8	258	e 13 13	+21	—	—	—	25.2
(I) Yokohama	Ag.	85.8	352	12 36	-16	—	—	e 52.9	62.2
(I) De Bilt	Ag.	85.8	352	12 54	+ 2	e 23 26	- 2	e 58.6	60.9

Continued on next page.

Station and Component.	Machine.	Δ	Azimuth.	P.		O - C.		S.		O - C.	L.	M.
				m.	s.	s.	m.	s.	s.	m.	m.	m.
(i) Barcelona		86.5	0	e 52	9	? L.				e 54.7	59.1	
(i) Rio Tinto	M.	89.9	7	50	15	? L.				(50.2)		
(ii) Riverview	M.	89.9	7									63.2
(i) Riverview		90.0	205	e 20	11	?						50.1
(i) Kodaikanal	M.	90.7	290	e 13	17	+ 1	e 23	30	-44			51.4
(i) Algiers	B.M.	91.2	359				e 25	15	+49	(48.8)		
(ii) San Fernando	B.M.	91.2	359							64.2		
(i) San Fernando		91.3	6	51	45	? L.				(51.8)		
(ii) Colombo	M.	91.9	285	54	15	? L.				(54.2)		
(ii) Helwan	M.	91.9	285									66.2
(i) Helwan	M.	94.2	335	25	15	? S	(25 15)		+17			
(i) La Paz	Bi.	115.1	89	e 19	59	? PR ₁				74.1		82.1
(ii) Cape Town	M.	158.3	320	38	49	? S	(38 49)		?			101.8

Additional records: Honolulu (i) gives $iS = +14m.39s.$, $?iSR_1$. Victoria (i) $S = -8m.46s.$, $?PR_1$. Kobe (ii) $S = +10m.45s.$ ($?PR_1$), $MN = -19.0m.$ Tucson $L = +50.5m.$ Ann Arbor (ii) $LN = +30.2m.$, $MN = -37.2m.$, and $+38.2m.$ Manila (ii) $MN = -20.3m.$ Toronto and Ottawa record several other L 's. Ithaca (ii) $LE = +37.2m.$ Georgetown (i) and (ii) records several L 's on both horizontal components. Washington (ii) $L = +38.7m.$ Cheltenham (i) $LE = -40.8m.$, (ii) $LE = -38.1m.$, $ME = +43.5m.$ Harvard (i) $LE = +36.3m.$, $MN = +40.4m.$, (ii) $LE = -32.3m.$, $MN = +42.1m.$ Eskdalemuir (i) $i = +20m.56s.$, $+23m.51s.$, and $+25m.46s.$ Bidston gives $S = 26m.39s.$ ($?SR_1$). Zagreb (i) $MNW = +49.2m.$, (ii) $MNW = +52.2m.$ Rocca di Papa (i) $M = -13.3m.$, (ii) $eL = +53.8m.$ Riverview (i) $ePR_2 = +24m.54s.$, $MN = +44.3m.$, (ii) $MN = +51.2m.$ San Fernando (ii) $MN = +65.2m.$

Dec. 9d. Records also at 1h. (Taihoku), 5h. (Tokyo (5)), 12h. (Helwan), 15h. (Athens), 17h. (Osaka), 18h. (Zi-ka-wei, Osaka, and Kobe), 20h. (Manila).

Dec. 10d. Records at 0h. (Helwan and Rocca di Papa), 1h. (Athens and La Paz), 9h. (Calcutta, Rocca di Papa, and Simla), 10h. (Rocca di Papa and Riverview), 16h. (Tokyo), 17h. (Riverview, La Paz, Manila, Honolulu, and Perth), 19h. and 21h. (La Paz).

Dec. 11d. 17h. 46m. 42s. Epicentre $0^\circ 5'N.$ $82^\circ 0'W.$ (as on 1917 May 3d.).

$A = +.139$, $B = -.990$, $C = +.009$; $D = -.990$, $E = -.139$;
 $G = +.001$, $H = -.009$, $K = -1.000$.

	Δ	Az.	P.		O - C.	S.	O - C.	L.	M.
		m.	s.	m.	s.	m.	s.	m.	m.
Balboa Heights	N.	8.8	16	2 8	- 5	—	—	5.7	5.9
	E.	8.8	16	2 32	+19	—	—	4.1	4.2
La Paz		21.8	142	5 4	+ 1	9 3	+ 2	11.5	14.9
La Quiaca	E.	27.7	146	13 48	? L	—	—	14.8	15.8
Andalgala	E.	31.9	152	16 36	? L	—	—	17.6	18.4
Pilar	E.	36.5	152	—	—	—	—	21.8	22.9
Cipolletti		41.5	164	—	—	—	—	22.8	26.7
Rio de Janeiro	E.	44.4	125	—	—	e 20 30	?	21.6	21.8
	E.	44.4	125	—	—	e 20 30	?	22.0	22.1
Edinburgh		83.3	34	46 18	? L	—	—	(46.3)	—
De Bilt		87.8	38	—	—	—	—	e 40.3	—
Helwan		109.8	58	65 18	? L	—	—	(65.3)	—

Additional records: La Paz gives $i = +11m.43s.$ and $+12m.12s.$ $T_0 = 7h.46m.48s.$ La Quiaca $PN = 13m.54s.$, $MN = +14.8m.$ For La Quiaca it is assumed that standard time 4h. 0m. 0s. is used as before.

Dec. 11d. Records also at 2h. (Kobe), 7h. (Perth), 9h. (Dehra Dun), 10h. (Manila), 13h. (Osaka), 14h. (Manila), 19h. (Batavia), 20h. (San Fernando), 21h. (Melbourne), 22h. (La Paz).

Dec. 12d. Records at 3h. (Harvard), 8h. (Balboa Heights), 10h. (Helwan), 12h. (La Paz (2)), 14h. (La Paz), 16h. (Manila), 23h. (San Fernando and La Paz).

Dec. 13d. 1h. 18m. 40s. Epicentre $26^{\circ}58'$, $70^{\circ}5'W$. (as on 1918 Dec. 9d. 10h., etc.).

$$A = +299, B = -844, C = -446.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Andalgala	3.9	107	-1 10	-131	—	—	-0.2	0.6
La Quiaca	6.1	46	—	—	—	—	4.3	4.8
Pilar	7.9	133	—	—	—	—	4.1	7.6
La Paz	10.2	13	e 2 34	+ 1	4 34	- 1	5.3	6.0
Cipolletti	12.6	171	6 26	L	—	—	6.7	7.7
Helwan	112.4	67	13 20	-109	—	—	—	—

Andalgala gives P at 1h.17m.30s. and L at 1h.18m.32s. For La Quiaca standard time 4h.0m.0s. west of Greenwich is assumed as before. Pilar gives LN = +4.2m., MN = +7.4m.

Dec. 13d. Records also at 0h. (Cipolletti), 1h. (La Paz), 2h. and 3h. (Helwan), 10h. (Monte Cassino), 11h. (La Paz), 12h. (La Paz and Perth), 15h. (Tokyo), 19h. (Manila), 21h. (Athens, Mizusawa, Osaka, and Ootomari), 22h. (De Bilt and Manila).

Dec. 14d. 18h. 39m. 15s. Epicentre $13^{\circ}08'$, $166^{\circ}8'E$. (as on 1918 March 20d. 1h.).

$$A = -949, B = +222, C = -225; \quad D = +228, E = +974; \\ G = +219, H = -051, K = -974.$$

The antipodal stations suggest a deep focus, and the evidence of Apia and Batavia in opposite azimuths supports this view. Hence a focal depth of 0.030 radius below normal has been adopted. Possibly the same supposition is applicable on 1918 Mar. 20d., but the material is not sufficiently decisive.

Station and Component.	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				M. s.	s.	M. s.	s.	M.	M.
Apia	-1.2	20.8	95	i 4 38	- 2	—	—	9.2	—
Riverview	-1.6	24.8	213	e 5 17	- 2	i 9 26	3	e 10.8	11.0
Perth	-3.1	50.3	239	11 44	? PR ₁	15 54	-10	17.2	—
Manila	-3.3	53.2	300	e 9 11	- 5	(16 27)	- 9	16.4	17.0
Batavia	-3.6	59.4	270	e 9 47	+ 2	—	—	—	19.8
Victoria	-4.2	86.9	36	—	—	—	—	20.3	51.0
Colombo	-4.2	88.7	277	22 45	? S	(22 45)	-29	—	—
Toronto	-4.7	116.1	47	—	—	(23 33)	?	58.6	71.0
La Paz	-4.7	118.1	117	e 20 0	? PR ₁	(30 50)	-173	30.8	—
Harvard	-4.8	122.3	48	—	—	—	—	62.2	—
Helwan	—	135.6	300	22 45	? PR ₁	—	—	—	—
De Bilt	—	138.2	343	e 22 53	? PR ₁	—	—	—	—
Graz	—	138.3	330	22 36	? PR ₁	e 47 27	?	—	—
Zagreb	—	139.0	328	19 6	- 32	—	—	—	22.8
Rocca di Papa	—	143.5	326	19 17	[-29]	—	—	—	19.5
Tortosa	—	149.7	339	19 38	[-17]	—	—	20.5	20.9
San Fernando	—	155.7	346	44 45	? SR ₁	—	—	—	110.2

Additional records: Riverview gives PS = +9m.45s. Victoria M = +24.2m.
Harvard eLE = +60.8m. De Bilt eN = +23m.0s.

Dec. 14d. Records also at 0h. (San Fernando), 4h. (Helwan), 8h. (Tokyo), 14h. (La Paz), 15h. (Melbourne), 16h. (Manila and Riverview), 19h. (Zagreb, Rocca di Papa, and Tortosa), 21h. (La Paz, Andalgala, La Quiaca, Cipolletti, and Pilar), 22h. (Helwan).

Dec. 15d. Records at 3h. (Monte Cassino), 8h. (Manila), 11h. (Tokyo), 21h. (Perth).

Dec. 16d. 3h. 3m. 20s. Epicentre $12^{\circ}0'N$, $95^{\circ}0'E$ (as on 1918 Jan. 18d.).

$$A = -.085, B = +.974, C = +.208; \quad D = +.996, E = +.087; \\ G = -.018, H = +.207, K = -.978.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Colombo	15.8	252	3 52	+ 3	—	—	9.1	10.7
Batavia	21.6	150	—	—	e 8 40	-17	—	15.7
Manila	25.5	83	—	—	e 11 3	+50	—	—
Mauritius	E. 48.6	229	6 52	-126	—	—	—	10.7
	N. 48.6	229	8 52	- 6	—	—	—	11.5
Helwan	61.3	298	16 40	?	—	—	—	—
Riverview	70.4	133	e 17 16	?PR ₁	—	—	e 43.1	51.4
Zagreb	73.9	314	i 11 49	+ 8	—	—	—	—
Rocca di Papa	76.3	312	11 43	-14	(20 28)	-73	e 20.5	21.6
Capetown	85.8	234	28 16	?SR ₁	—	—	—	33.3
San Fernando	E. 91.7	310	54 40	?L	—	—	(54.7)	—
La Paz	163.1	253	20 11	{ + 1}	—	—	72.0	76.2

Riverview gives MN = +47.1m.

Dec. 16d. 10h. 11m. 20s. Epicentre $26^{\circ}3'N$, $121^{\circ}5'E$.

$$A = -.468, B = +.764, C = +.443; \quad D = +.853, E = +.522; \\ G = -.231, H = +.378, K = -.896.$$

	Δ	Az.	P.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m.	m.
Taihoku	1.3	179	0 16	- 4	—	—
Zi-ka-wei	4.9	359	e 1 19	+ 3	—	—
Manila	11.7	182	e 2 57	+ 2	—	—
Helwan	77.4	297	17 40	?PR ₁	—	—
Hohenheim	83.7	321	e 13 55	+75	—	—
De Bilt	E. 84.0	326	e 13 6	+24	15.7	16.1
	N. 84.0	326	e 13 13	+31	—	16.6
Uccle	85.1	325	—	—	—	35.5
Rocca di Papa	85.4	315	—	—	e 16.0	17.7
Eskdalemuir	85.8	331	(18 40)	?PR ₁	18.7	—

Zi-ka-wei gives its record 10m. too soon.

Dec. 16d. 20h. 20m. 10s. Epicentre $14^{\circ}0'N$, $60^{\circ}0'E$ (as on 1917 Dec. 5d.).

$$A = +.485, B = +.840, C = +.242.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Colombo	20.7	4 50	+ 1	—	—	—	—
Helwan	30.8	6 50	+14	—	—	—	—
De Bilt	57.7	12 38	?PR ₁	—	—	e 15.5	16.1
Paris	58.3	—	—	17 50	-13	—	—
Shide	61.1	—	—	19 25	+48	—	—

Eskdalemuir ($\Delta = 85^{\circ}8$) gives 20h. 34m. to 20h. 49m.

Dec. 16d. Records also at 1h. (Rocca di Papa and Zagreb), 4h. (Zagreb), 8h. (Tokyo), 10h. (La Paz and Rocca di Papa), 20h. (Graz and Rocca di Papa), 21h. (Manila, Melbourne, and Riverview).

Dec. 17d. Records at 0h. and 2h. (San Fernando), 8h. (Helwan), 13h. (Kobe), 14h. (Mizusawa), 23h. (San Fernando).

Dec. 18d. 17h. 15m. 55s. Epicentre $25^{\circ}0'N$, $119^{\circ}5'E$ (as on 1918 Jan. 15d.).

$$A = -.446, B = +.789, C = +.423.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Hokoto	1.5	179	0 25	+ 2	—	—	—	—
Taihoku	1.9	89	—	—	0 55	+ 2	1.3	—
Zi-ka-wei	6.4	15	e 1 58	+20	—	—	—	5.1
Manila	10.5	172	e 2 29	- 8	—	—	4.2	4.7
De Bilt	84.1	326	—	—	—	—	e 48.1	—
Bidston	87.2	330	—	—	—	—	—	49.1

Dec. 18d. Records also at 6h. (Riverview), 11h. (Helwan), 12h. (Tokyo), 15h. (Manila), 16h. (La Paz), 21h. (Batavia, Colombo, Zi-ka-wei, Kodaikanal, and Manila), 22h. (Helwan and San Fernando).

Dec. 19d. 19h. 23m. 0s. Epicentre $11^{\circ}0'S$. $165^{\circ}0'E$. (as on 1918 Aug. 23d.).

$\Lambda = -.948$, $B = +.254$, $C = -.191$; $D = +.259$, $E = +.966$;
 $G = +.184$, $H = -.049$, $K = -.982$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia	22.8	100	—	—	—	—	7.0	—
Riverview	26.1	207	—	—	e 10 12	-12	e 14.0	17.8
Melbourne	32.3	210	—	—	13 0	+47	18.4	20.8
Adelaide	33.9	221	—	—	—	—	—	24.0
Perth	49.8	237	—	—	15 48	-28	—	—
Victoria	86.5	39	—	—	—	—	48.0	57.4
Colombo	86.6	277	65 0	?L	—	—	(65.0)	70.0
Kodaikanal	89.6	280	67 0?	?L	—	—	(67.0?)	—
Toronto	115.9	46	—	—	—	—	61.0	—
Ottawa	E. 118.1	44	—	—	—	—	e 77.0	—
Andalgala	E. 117.1	129	44 36	?L	—	—	(44.6)	57.6
Helwan	133.1	301	89 0	?L	—	—	(89.0)	—
San Fernando	153.4	344	93 0	?L	—	—	(93.0)	—

Additional records: Riverview gives MN = +15.2m.
 PN = +92m.0s.

San Fernando

Dec. 19d. Records also at 4h. (Tokyo), 5h. (San Fernando), 7h. (La Paz), 12h. (Rocca di Papa and Manila).

Dec. 20d. Records at 0h. (Manila), 2h. (La Paz), 4h. (Tokyo), 6h. (Kodaikanal), 7h. (Apia), 9h. (La Paz), 10h. (Helwan), 22h. (Kobe).

Dec. 21d. 9h. 24m. 40s. Epicentre $1^{\circ}0'N$. $70^{\circ}0'W$. (as on 1918 Mar. 16d.).

$A = +.342$, $B = -.940$, $C = +.018$; $D = -.940$, $E = -.342$;
 $G = +.006$, $H = -.016$, $K = -1.000$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	E. 12.4	311	3 6	+ 1	—	—	5.2	5.2
	N. 12.4	311	3 9	+ 4	—	—	5.2	5.3
La Paz	17.6	174	i 4 3	- 9	i 7 13	-18	8.1	8.3
Port au Prince	17.7	353	e 4 59	+46	—	—	—	5.3
Vieques	17.7	14	(5 14)	+61	—	—	5.8	12.5
La Quiaca	E. 23.6	172	5 20	- 4	(9 8)	-28	9.1	9.6
Andalgala	E. 28.8	173	—	—	11 38	+25	(11.6)	12.6
Pilar	N. 33.2	170	11 50	?S	(11 50)	-37	—	13.9
Georgetown	N. 38.4	352	7 41	0	—	—	e 17.4	—
	E. 38.4	352	7 44	+ 3	13 43	- 1	22.3	—
Washington	38.4	352	7 40	- 1	13 12	-32	22.3	—
Cipolletti	39.6	177	12 56	?S	(12 56)	-64	14.7	16.0
Harvard	N. 41.4	359	i 8 1	- 5	(e 9 59)	? e	10.0	—
Ithaca	41.8	354	e 8 46	+37	14 34	+ 2	19.6	—
Ann Arbor	43.1	345	8 20	+ 1	—	—	—	—
Toronto	43.4	350	—	—	15 2	+ 8	e 22.8	24.9
Ottawa	44.7	354	8 34	+3	15 12	+ 1	e 20.8	—
Victoria	65.8	324	13 53	?PR ₁	18 19	-76	27.6	38.5
Coimbra	68.0	46	10 46	-18	20 2	0	34.0	—
San Fernando	E. 68.6	51	20 50	?S	(20 50)	+41	—	—
Eskdalemuir	76.1	33	—	—	21 20	-18	—	—
Edinburgh	76.4	32	16 50	?	—	—	—	23.8
Kew	76.7	37	—	—	—	—	—	23.3
De Bilt	E. 80.1	37	—	—	22 52	+28	39.3	42.4
	N. 80.1	37	—	—	e 23 20	+56	37.8	38.4
Rocca di Papa	83.9	48	—	—	(e 23 32)	+ 24	e 23.5	28.5
Graz	86.2	42	e 16 54	?PR ₁	i 23 32	0	—	—
Zagreb	86.5	41	e 16 59	?PR ₁	—	—	—	23.6
Helwan	99.3	60	24 20	?S	(24 20)	-89	—	—

Additional records: Vieques gives MN = +10.4m. For La Quiaca standard time 4h.0m.0s. has been assumed as before. Andalgala MN = +13.1m. Pilar PE = +11m.38s. Georgetown iN = +8m.16s., T₀ = 9h.24m.44s. Harvard eN = +8m.42s., iN = +8m.48s., eE = +16m.6s., eN = +17m.54s., T₀ = 9h.21m.12s. Ithaca e = +17m.50s. Ottawa LN = +26.3m., T₀ = 9h.24m.51s. Coimbra LN = +31.6m., T₀ = 9h.24m.9s. San Fernando PN = +21m.20s. De Bilt ePR₁E = +16m.28s.

Dec. 21d. Records also at 2h. (Helwan), 4h. (Batavia and Manila), 9h. (Osaka), 10h. (Mizusawa and Tokyo), 12h. (Denver), 15h. (Batavia), 17h. (Fordham and Batavia), 19h. (Manila), 20h. (Batavia), 21h. (Fordham), 23h. (San Fernando).

Dec. 22d. 21h. 2m. 13s. Epicentre $38^{\circ}5'N$, $142^{\circ}5'E$.

$$A = -.621, B = +.476, C = -.623.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	\circ	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	1.2	0 17	- 1	0 31	- 2	—	—
Tokyo	3.6	0 52	- 4	1 29	-10	—	—
Osaka	6.8	2 7	+23	(3 13)	- 8	3.2	5.0
Kobe	7.1	1 56	- 8	(3 18)	- 5	3.3	3.8
De Bilt	82.1	—	—	—	—	e 46.8	51.8
Helwan	86.3	56 47	?L	—	—	(56.8)	—
San Fernando	99.7	54 47	?L	—	—	(54.8)	—

Additional records: Mizusawa gives PN = +18s.

Dec. 22d. Records also at 1h. and 8h. (Helwan), 17h. (Manila and La Paz).

Dec. 23d. 19h. 40m. 15s. Epicentre $33^{\circ}6'N$, $116^{\circ}4'W$. (as on 1918 April 21d.).

$$A = -.370, B = -.746, C = +.553; \quad D = -.896, E = +.445; \\ G = -.246, H = -.496, K = -.883.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	\circ		m. s.	s.	m. s.	s.	m.	m.
Tucson E.	4.8	104	14 20	?	—	—	19.2	20.5
Berkeley	6.4	313	e 21 15	?	—	—	—	—
Victoria	15.7	343	—	—	—	—	—	32.0
Ann Arbor E.	27.0	62	—	—	14 57	?L	18.8	24.8
Toronto	30.3	60	12 33	?S	18 27	?L	(18.4)	22.0
Georgetown	31.9	69	e 16 49	?L	18 25	?	(16.8)	—
Washington	31.9	69	e 18 10	?L	—	—	e 19.1	—
Cheltenham E.	32.0	69	15 31	?	—	—	19.6	20.0
N.	32.0	69	14 36	?	—	—	19.2	20.0
Ithaca E.	32.3	62	—	—	e 14 0	+107	18.9	—
Ottawa	33.1	57	—	—	e 15 45	?L	e 19.8	—
Balboa Heights	41.8	117	6 45	-84	—	—	—	—
Vieques E.	47.8	94	9 16	+23	—	—	19.9	20.2
N.	47.8	94	9 25	+32	15 35	-16	20.1	—
La Paz	68.0	130	e 10 55	- 9	e 20 19	+17	34.2	36.3
Bidston	75.6	34	—	—	—	—	—	42.8
De Bilt	80.3	32	—	—	—	—	e 48.8	51.1
San Fernando	84.4	49	40 55	?L	—	—	(40.9)	—
Helwan	109.5	29	66 45	?L	—	—	(66.8)	—
Cape Town	142.8	103	64 27	?L	—	—	(64.4)	70.0

Additional records: Toronto gives e = +5m.45s. and +11m.3s., eL = +20.0m. and +20.8m., $T_0 = 19h.45m.18s.$ Georgetown SN? = +18m.23s. Ottawa L = +29.8m. La Paz iP = +11m.5s., $T_0 = 19h.39m.44s.$ San Fernando PN = +33m.15s.

Dec. 23d. Records also at 0h. (Taihoku), 3h. (Helwan, La Paz, Manila (2), and Batavia), 4h. (Manila), 5h. (Helwan), 7h. (Rio Tinto), 9h. (Batavia and Colombo), 10h. (Helwan), 12h. (Taihoku), 13h. (Helwan), 20h. (Honolulu).

Dec. 24d. Records at 0h. (San Fernando and Tokyo), 1h. (Helwan), 5h. (Mauritius), 7h. (Rio Tinto), 12h. (Zi-ka-wei), 13h. (De Bilt), 14h. (San Fernando), 19h. (Helwan), 21h. (Batavia), 22h. (Kobe).

1918. Dec. 25d. 10h. 21m. 10s. Epicentre 7°0S. 153°0E.

A = -0.884, B = +0.451, C = -0.122; D = +0.454, E = +0.891;

G = +0.109, H = -0.055, K = -0.992.

Although there is no direct evidence from antipodal stations, a focal depth 0.070 has been assumed: see Note at end for the argument.

Station and Component.	Machine.	Corr. for Focus	Δ	Azimuth.	P.	O-C.	S.	O-C.	L.	M.
					M. S.	S.	M. S.		M.	M.
Riverview	—	-3.8	26.9	183	e 5 6	-12	i 9 6	-21	e 11.2	11.5
Sydney	M.	-3.8	26.9	183	—	—	9 8	-19	11.5	12.0
Adelaide	M.	-4.3	30.9	201	10 21	? S	(10 21)	-12	15.8	16.8
Melbourne	M.	-4.4	31.6	192	—	—	10 14	-31	12.9	17.1
Manila	W.	-5.2	38.4	306	e 6 50	- 8	—	—	—	—
Taihoku	O.	-5.7	44.3	320	—	—	—	—	—	13.9
Tokyo	O.	-5.8	44.4	347	7 43	0	13 30	-16	—	—
Osaka	O.	-5.8	44.8	342	7 42	- 4	(13 47)	- 5	13.8	16.2
Batavia	W.	-5.8	45.8	271	7 57	+ 2	—	—	—	18.8
Mizusawa	O.	-5.9	47.4	350	7 56	-11	14 9	-19	—	—
Zi-ka-wei	—	-6.0	48.7	324	8 15	- 1	i 14 53	+ 9	—	—
Honolulu	M.	-6.4	55.7	60	8 2	-60	i 15 14	-56	e 28.0	31.7
Calcutta	O.E.	-7.5	69.8	299	10 2	-25	19 26	+34	—	—
Colombo	M.	-7.9	74.3	280	10 50	- 4	(19 50)	+ 8	19.8	21.3
Kodaikanal	M.	-8.1	77.2	283	20 56	? S	(20 56)	+41	—	—
Bombay	O.E.	-8.3	83.0	291	13 21	+94	—	—	—	21.6
Victoria	M.	-8.6	91.1	42	—	—	—	—	28.9	55.0
Mauritius	M.	-8.7	92.3	250	46 26	? L	—	—	(46.4)	50.0
Cipolletti	M.	—	120.4	144	27 56	? S	(27 56)	-56	29.9	37.3
Cape Town	M.	—	120.6	223	20 32	? PR ₁	—	—	—	67.5
Toronto	M.	—	121.5	40	—	—	—	—	63.0	—
Ottawa	—	—	123.2	39	e 38 30	? SR ₁	—	—	e 62.8	—
Graz	W.	—	125.9	324	e 20 18	? PR ₁	—	—	—	—
Zagreb	W.	—	126.4	323	e 19 14	[+ 5]	e 31 30	+114	—	—
Edinburgh	M.	—	127.6	342	23 50	? S	—	—	—	36.8
De Bilt	N.	—	127.8	335	e 26 15	? S	37 22	? SR ₁	e 61.8	66.6
Uccle	E.	—	127.8	335	e 24 53	? S	37 21	? SR ₁	e 57.8	66.9
Bidston	—	—	129.0	334	21 4	? PR ₁	e 31 50	+116	—	—
Rocca di Papa	M.S.	—	129.6	340	23 2	? PR ₁	—	—	—	46.0
Paris	Ag.	—	130.6	321	i 21 13	? PR ₁	—	—	e 37.6	39.5
Moncalieri	—	—	131.3	334	27 7	? S	—	—	37.8	39.8
La Paz	S.	—	131.6	328	e 20 57	? PR ₁	30 11	0	38.1	—
Coimbra	Bi.	—	133.0	120	28 27	? S	(28 27)	? S	—	—
	—	—	142.8	337	—	—	e 31 31	+11	59.5	—

Additional records: Riverview gives $PR_1 = +6m.13s.$, $i (PR_1) = +7m.10s.$, $MN = +21.8m.$, $MZ = +16.8m.$ Adelaide $S = +12m.56s.$ ($?SR_1$).
 Osaka $MN = +16.0m.$ Batavia $S? = +8m.39s.$, $M = +10.7m.$ Toronto
 $L = +70.2m.$ and $+71.2m.$ Graz $SR_1 = +37m.5s.$ La Paz $S = +31m.24s.$ ($?SR_1$). De Bilt $e = +39m.43s.$ Paris $MN = +41.8m.$
 Rocca di Papa $M = +21.3m.$, 2sec. after P.

It seems desirable to give the evidence for deep focus in detail. Taking $T_0 = 25d.10h.21m.10s.$, we have the following accordant determinations of Δ .

	P.	S.	Δ from P.	Δ from S.
	m. s.	m. s.	°	°
Riverview	5 6	9 6	22.1	22.1
Tokyo	7 43	13 30	38.6	37.4
Mizusawa	7 56	14 9	40.1	40.1
Zi-ka-wei	8 15	14 53	42.6	43.3

Two other stations, Honolulu and Calcutta, would favour a different T_0 . Using the value adopted we get

	P.	S.	Δ from P.	Δ from S.
	m. s.	m. s.	°	°
Honolulu	8 2	15 14	40.9	44.9
Calcutta	10 2	19 26	58.5	65.1

But the determinations of T_0 would differ sensibly in the two cases. There does not seem sufficient reason to modify the value of T_0 above adopted. Using it we may add the following value of Δ from observed single records :

	P.	S.	Δ from	
	m. s.	m. s.	P.	S.
Sydney	—	9 8	—	22.1
Melbourne	—	10 14	—	25.6
Adelaide	—	10 17	—	25.7
Manila	6 50	—	32.2	—
Osaka	7 42	—	38.5	—
Batavia	7 57	—	40.2	—

Now the fundamental difficulty in satisfying these observations without the hypothesis of a deep locus is shown by the first two stations, Riverview and Tokyo. The sum of their observed values of Δ is at most $60^{\circ}7$, whereas the distance between them is $70^{\circ}3$. Two sides of a triangle are considerably less than the third. And this difficulty arises in other cases. We have four consistent Australian stations south of the Epicentre and 4 Japanese stations to the north, besides Manila and Batavia. Taking a southern station (say Adelaide) and a northern (say Mizusawa), the sum of the observed distances is $65^{\circ}8$, whereas the direct distance Adelaide-Mizusawa is $74^{\circ}1$. To make a solution we must suppose the observed distances effectively diminished. Unfortunately in this instance we do not get any help from the antipodal stations, and must adopt a focal depth by trial and error. The minimum focal depth which will suit the pairs of stations quoted is that which just makes the sums of the corrected distances equal to the distance between stations with focal depths, as below.

	Sum.	Corr. to sum for depths.				Corr. Required.
		-0.30	-0.40	-0.50	-0.60	
Riverview to Tokyo	$22.1 + 38.0 = 60.1$	4.1	5.5	7.0	8.5	9.6
Adelaide to Manila	$25.7 + 40.1 = 65.8$	4.6	6.2	7.4	8.8	8.3

It will be seen that a depth of 0.060 at least is required to make up the difference between the sum of the separate Δ s, as corrected, and the direct arc between stations. The depth adopted is a little greater, viz., 0.070; and since the residuals are still negative on the whole, we certainly have not gone too far. It will be seen that the assumption of an error of 1 min. in both P and S will bring the Honolulu observations into line.

Dec. 25d. 10h. 31m. 45s. Epicentre $41^{\circ}5N$, $7^{\circ}0W$.

$$A = +.744, B = -.091, C = +.663.$$

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Coimbra	1.7	220	0 23	- 3	—	—	0.8	0.9
San Fernando	5.1	173	3 3	?L	—	—	(3.0)	—
Granada	5.1	148	2 23	?S	4 16	?	—	—
Tortosa	5.7	94	1 28	0	—	—	3.0	3.2

No additional records.

Dec. 25d. Records also at 0h. (San Fernando), 1h. (Batavia), 6h. (Harvard), 7h. (San Fernando), 10h. (Helwan), 15h. (Tokyo), 20h. (Helwan), 21h. (Kobe, Athens (2), and De Bilt). (Harvard records at 6h. an explosion at Maynard Mass.).

Dec. 26d. Records at 2h. (La Paz), 3h. (San Fernando), 8h. (Ottawa, Athens, and La Paz), 9h. (De Bilt and Helwan), 19h. and 21h. (San Fernando), 22h. (La Paz).

Dec. 27d. Records at 1h. (Taihoku), 2h. (La Paz and Helwan), 5h. (Bidston), 8h. (Balboa Heights), 9h. (Mizusawa), 16h. (Simla), 20h. (San Fernando), 21h. (Tokyo and Mizusawa), 23h. (Colombo).

Dec. 28d. 8h. 9m. 20s. Epicentre $13^{\circ}\cdot 0S$. $136^{\circ}\cdot 0E$. (as on 1918 Mar. 10d.).

$$A = -.701, B = +.677, C = -.225; \quad D = +.695, E = +.719; \\ G = +.162, H = -.156, K = -.974.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	25.0	149	e 5 38	0	e 10 2?	- 1	e 10.8	12.5
Sydney	25.0	149	e 4 58	-40	—	—	11.1	12.2
Melbourne	26.0	164	(5 58)	+10	—	—	6.0	13.0
Perth	26.5	221	—	—	11 0	+28	—	—
Colombo	59.2	286	22 40	?SR ₁	—	—	—	25.7
Helwan	109.1	297	53 40	?L	—	—	(53.7)	—
La Paz	142.1	140	23 49	?PR ₁	—	—	—	—

Riverview gives $e = +7m.57s$.Dec. 28d. 18h. 3m. 10s. Epicentre $3^{\circ}\cdot 3S$. $12^{\circ}\cdot 0W$.

$$A = +.976, B = -.208, C = -.058; \quad D = -.208, E = -.978; \\ G = -.056, H = +.012, K = -.998.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
San Fernando	E. 40.1	9	—	—	—	—	20.3	21.8
Rio Tinto	41.4	8	16 50	?SR ₁	—	—	—	23.8
Cape Town	41.7	143	14 38	?S	(14 38)	+ 7	—	24.0
Algiers	42.5	21	e 8 9	- 6	14 30	-12	21.8	23.3
Coimbra	43.7	5	8 4	-20	14 34	-24	21.0	24.6
Tortosa	45.6	12	8 15	-22	—	—	23.8	28.1
Barcelona	46.6	15	10 25	?PR ₁	—	—	e 21.7	27.8
Rocca di Papa	50.4	25	e 9 17	+ 8	16 14	-10	e 25.9	28.6
Moncalieri	51.4	19	e 8 52?	-24	i 16 38	+ 2	24.2	27.6
Paris	53.7	11	—	—	e 17 0	- 5	25.8	28.8
Shide	54.8	8	—	—	21 6	?SR ₁	—	—
Kew	55.7	9	—	—	—	—	—	31.8
Uccle	55.9	13	—	—	e 17 26	- 7	e 27.8	—
La Paz	56.6	254	9 48	- 2	i 17 35	- 6	26.5	27.4
Bidston	57.2	8	17 32	?S	(17 32)	-17	—	31.4
De Bilt	N. 57.3	13	—	—	17 53	+ 3	e 25.8	29.2
	E. 57.3	13	—	—	—	—	e 24.8	29.8
Eskdalemuir	59.1	7	i 18 12	?S	(i 18 12)	0	23.8	—

Additional records: San Fernando gives $PE = 17h.52m.30s.$, belonging to an earlier shock. The North component records are each one minute earlier than the corresponding East record. $MN = +20.8m.$ Coimbra $MN = +23.7m.$, $T_0 = 18h.3m.1s.$ Rocca di Papa $e = 17h.59m.48s.$ (earlier shock), $P = +9m.5s.$ and $eL = +26.8m.$ Moncalieri $MN = +31.0m.$ All these records are given as 17h. instead of 18h., $T_0 = 18h.2m.21s.$ Paris gives S as e_2 , also $e_1 = 17h.59m.23s.$, $MN = +31.8m.$ La Paz gives $1^{\circ}\cdot 8S$. $13^{\circ}\cdot 3W.$, $T_0 = 18h.3m.15s.$

Dec. 28d. Records also at 4h. (Riverview and San Fernando), 8h. (Batavia and Manila), 9h. (Colombo), 16h. (La Paz and Moncalieri), 17h. (Edinburgh and Helwan), 18h. (De Bilt), 20h. (Taihoku), 21h. (Fordham), 23h. (Mizusawa and Rocca di Papa).

Dec. 29d. Record at 0h. (Athens), 1h. (La Paz), 2h. and 5h. (Colombo), 6h. (Riverview), 13h. (Tokyo), 22h. (Fordham).

Dec. 30d. 7h. 11m. 45s. Epicentre $4^{\circ}5'S$. $152^{\circ}0'E$. (as on 1918 July 23d.).

$A = -.880$, $B = +.468$, $C = -.079$; $D = +.470$, $E = +.883$;

$G = +.069$, $H = -.037$, $K = -.997$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	29.2	182	e 6 17	- 3	11 22	+ 2	e 14.7	17.6
Sydney	29.2	182	6 15	- 5	—	—	15.0	17.8
Adelaide	32.8	200	13 33	?S	(13 33)	+72	17.5	18.8
Melbourne	33.9	190	—	—	16 21	?L	19.2	22.2
Manila	36.2	302	—	—	e 13 15	+ 2	—	—
Batavia	44.9	266	e 9 15	+43	—	—	—	—
Honolulu	55.3	60	e 24 39	?L	—	—	31.0	36.2
Helwan	118.7	302	70 15	?L	—	—	(70.2)	—
De Bilt	125.1	336	—	—	—	—	e 61.2	—

Additional records: Riverview gives $MN = +17.8m$. Sydney gives P at $8m$. instead of $18m$. Corrected above by comparison with Riverview. Adelaide $S = +15m.58s$. (?SR₁). Taihoku ($\Delta = 41^{\circ}.8$) gives $e = 7h.10m.0s$.

Dec. 30d. Records also at 1h. (Perth), 5h. (Kobe), 16h. and 23h. (Lick).

Dec. 31d. Records at 0h. (Zurich), 1h. (Mauritius), 2h. (Riverview and Helwan), 3h. (Denver), 5h. (Helwan, Osaka, Mizusawa, and Tokyo), 7h. (Helwan), 8h. (Kodaikanal), 10h. (Taihoku), 19h. (La Paz), 22h. (Manila).

APPENDICES TO INT. SEIS. SUM. FOR 1918.

(α) REPETITIONS OF THE CHILE EARTHQUAKE
OF 1918 DEC. 4.

The Earthquake of December 4, destructive at Copiapo, was followed by several well-established repetitions from the same focus (or near it). Besides these a number of shocks were registered at La Paz which *may* be from the same focus, though in many cases this is only a presumption. It may be convenient to give here a complete list of the La Paz records of P, so that hypotheses as to the nature of repetition may be readily tested. The intervals by which S, or L, follow P are also given. The columns N, C, and P-C are explained below.

La Paz records which may be repetitions.									
	P.			S.		L.	N.	C.	P-C.
	d.	h.	m. s.	m.	s.	m.		m.	m.
Dec.	4	4	36 8	+2	7	—	0	36	+ 0.1
"	4	11	50 6	+2	8	+2.6	21	57	— 6.9
"	4	13	24 38	—	—	—	25	21	+ 3.6
"	4	13	48 36	—	—	—	26	42	+ 6.6
"	4	13	58 10	+2	9	+2.8	27	3	— 4.8
"	4	15	36 14	+2	13	+3.2	31	27	+ 9.2
"	4	15	51 34	—	—	+2.8	32	48	+ 3.6
"	4	16	33 30	—	—	—	34	30	+ 3.5
"	4	16	38 0	+1	58	+2.7	34	30	+ 8.0
"	4	16	46 5	—	—	—	35	51	— 4.9
"	4	17	23 30	—	—	—	37	33	— 9.5
"	4	17	44 10	+2	8	+3.2	38	54	— 9.8
"	4	18	40 0	+2	17	+3.0	40	36	+ 4.0
"	4	19	17 30	—	—	—	42	18	— 0.5
"	4	19	25 0	—	—	—	42	18	+ 7.0
"	4	19	28 25	+2	10	+2.6	42	18	+10.4
"	4	20	2 15	—	—	—	44	0	+ 2.3
"	4	20	18 40	—	—	—	45	21	— 2.3
"	4	20	25 14	—	—	—	45	21	+ 4.2
"	4	20	34 38	—	—	—	46	42	— 7.4
"	4	20	42 20	—	—	—	46	42	+ 0.3
"	4	21	34 45	—	—	—	48	24	+10.8
"	4	23	17 45	—	—	—	53	9	+ 8.8
"	4	23	25 7	—	—	—	54	30	— 4.9
"	5	1	10 25	—	—	—	59	15	— 4.6
"	5	1	15 55	—	—	—	59	15	+ 0.9
"	5	1	21 10	+2	13	+3.3	59	15	+ 6.2
"	5	5	25 37	—	—	—	71	27	— 1.4
"	5	5	31 30	—	—	—	71	27	+ 4.5
"	5	5	48 7	+2	12	+2.9	72	48	+ 0.1
"	5	7	1 0	—	—	—	75	51	+10.0
"	5	7	37 25	—	—	—	77	33	+ 4.4
"	5	7	47 18	—	—	—	78	54	— 6.7
"	5	8	1 30	—	—	—	78	54	+ 7.5
"	5	9	14 30	—	—	+3.5	82	18	— 3.5
"	5	12	38 15	—	—	—	92	48	— 9.7
"	5	12	41 50	+2	5	+2.8	92	48	— 6.2
"	5	13	45 0	—	—	—	95	51	— 6.0
"	5	14	56 45	—	—	—	98	54	+ 2.8
"	5	18	(15) 30	—	—	+3.0	108	24	— 8.5
"	5	18	26 10	+2	1	+2.6	108	24	+ 2.2
"	5	19	2 20	—	—	—	110	6	— 3.7
"	5	20	11 50	+2	6	+2.9	113	9	+ 2.8
"	5	20	29 25	+2	12	+2.9	114	30	— 0.6
"	5	21	39 50	—	—	—	117	33	+ 6.8
"	5	22	17 3	+0	55	+1.6	119	15	+ 2.0
"	5	22	48 53	+2	16	+3.1	121	57	— 8.1
"	5	23	8 22	+2	17	+3.5	122	18	— 9.6
"	6	0	13 31	—	—	—	125	21	— 7.5
"	6	4	28 36	—	—	—	137	33	— 4.4

Continued on next page.

La Paz Records which may be repetitions.

	P.		S.	L.	N.	C.	P-C.
	d.	h. m. s.	m. s.	m.		m.	m.
Dec.	6	7 24 23	+2 7	+2.6	145	21	+ 3.4
"	6	23 35 10	—	+3.3	191	27	+ 8.2
"	7	12 42 5	+2 11	+2.9	229	45	- 2.9
"	7	19 1 23	+2 10	—	247	3	- 1.6
"	8	9 45 0	+2 9	-3.0	289	45	0.0
"	9	11 2 4	+2 29	+3.3	361	57	+ 5.1
"	10	1 51 37	—	—	404	60	- 8.4
"	10	17 22 22	—	—	448	24	- 1.6
"	10	19 44 54	—	—	455	51	- 6.1
"	10	21 28 19	—	—	460	36	- 7.7
"	12	14 18 11	—	—	576	12	+ 6.2
"	12	23 59 11	—	+2.4	604	60	- 0.8
"	13	1 21 14	-2 0	+2.8	608	24	- 2.8
"	13	1 58 17	—	—	610	66	- 7.7
"	13	11 30 55	—	—	637	33	- 2.1
"	13	12 10 15	—	—	639	15	- 4.7
"	14	21 54 10	+2 2	+3.2	735	51	+ 3.2
"	16	10 23 12	+2 0	+3.1	839	15	- 8.2
"	18	16 36 11	—	-2.5	994	30	+ 6.2
"	19	7 41 44	—	—	1037	33	- 8.7
"	20	2 21 56	—	—	1091	27	- 5.1
"	20	9 38 0	+2 15	-2.9	1111	48	-10.0

In previous numbers of this Summary and in the Geoph. Sup. to the Mon. Not. R.A.S., a periodicity of just over 21min. has been suggested for the recurrence of earthquakes. To test its applicability in the present instance the records of P are compared with the nearest multiple of 21.0min. from the first record (neglecting the seconds). The column N shows the number of multiples of 21min. elapsed, and the column C gives the minutes of the calculated epoch: thus, N=21 corresponds to an interval $21 \times 21\text{min.} = 7\text{h.}21\text{m.}$ since 4d.4h.36.0m., i.e., to 4d.11h.57m. The 4d.11h. can be inferred from the column P: the 57m. is given in column C, and $P-C=50.1\text{m.} - 57.0\text{m.} = -6.9\text{m.}$ The values of $P-C$ should cluster about zero if the repetitions follow the main shock after multiples of 21min., but they show no such tendency. Collecting them under each minute as below:—

Minute	0	1	2	3	4	5	6	7	8	9	10
Pos.	5	0	5	5	4	1	5	2	5	1	4
Neg.	3	3	4	2	6	1	5	4	3	4	
Sum.	8	3	9	7	10	2	10	6	8	5	(8)

The second line gives the numbers of positive residuals and the third the number of negative. In the fourth they are added together, as this process has previously been found effective. But it is seen that there is no clustering of any importance. It may be that we ought to limit attention to those cases where there is an S or L record confirming the P, thus:—

Min.	0	1	2	3	4	5	6	7	8	9	10
Pos.	3	0	3	3	1	1	2	0	3	1	2
Neg.	2	1	2	1	1	0	2	0	2	2	
Sum.	5	1	5	4	2	1	4	0	5	3	(4)

but again there is no appreciable clustering.

It will be noticed that the second shock follows the first by 7h. 14m., which is sensibly not a multiple of 21m. Now the second shock was much greater than the first, and it may be that we ought to have reckoned from it as starting point. But the clustering would then have appeared near the minute—7m. If it is only slight, we may have obscured it in adding together positive and negative residuals. Re-writing with -7min. as zero we should get—

Min.	0	1	2	3	4	5	6	7	8	9	10
Pos.	5	1	6	2	4	3	3	5	0	5	5
Neg.	4	3	4	4	1	5	2	5	1	4	
Sum.	9	4	10	6	5	8	5	10	1	9	(10)

The numbers near 0min. are now slightly larger than the others, but no importance can be attached to the excess.

Some success was also obtained by assuming a slight alteration to period, taking it for instance as 20.8min., but this seems inconsistent with other results.

There are difficulties in testing Dr. Jeans's periods of 125.8m. and 222m. owing to the number of quite short intervals, which seem to require some additional hypothesis for fitting these long periods.

Attention may also be drawn to the series of shocks from $18^{\circ}5'N$. $68^{\circ}0'W$., as follows:—

	T_0				N.	C.	$T_0 - C.$	
	d.	h.	m.	s.		m.	m.	m.
Oct.	11	14	14	25	0	14.0	+	0.4
"	11	17	3	34	8	2.0	+	1.6
"	12	0	15	30	29	23.0	—	7.5
"	12	8	19	37	52	26.1	—	6.5
"	13	4	51	30	110	44.1	+	7.5
"	14	0	24	20	166	20.2	+	4.1
"	14	2	15	20	172	26.2	—	10.9
"	17	8	19	3	395	29.5	—	10.4
"	18	21	33	35	501	35.7	—	2.1
"	25	3	42	50	930	45.3	—	2.5
Nov.	12	12	1	35	2188	5.0	—	3.4
"	12	21	44	32	2216	53.0	—	8.5

Since the later multiples are large, the more accurate value of the period 21.00136608min. (Geop. Sup. M.N.I. p. 98) has been used in column C. There is some tendency to cluster about -1.5 min. and -8.5 min., but the evidence could only be of value in conjunction with other evidence. Recurring now to the case of the Chile earthquake something of the same kind is observed if we exclude the early repetitions. It seems quite possible that, after a severe shock, waves of various kinds may persist for some time, causing a complex of subsequent shocks which may be difficult to analyse: so that a regular pulsation, if it exists, will only get a chance to declare itself after these miscellaneous shocks have subsided. If, therefore, we exclude values of N less than 80 say (80×21 min. = 28 hours) then the La Paz records analyse as below:—

Min.	0	1	2	3	4	5	6	7	8	9	10
Pos.	1	0	4	2	0	1	3	0	3	0	1
Neg.	2	2	3	2	2	1	3	3	3	2	1

and we see again a slight clustering, about -2 and -7 in this case. Rearranging with -4 as zero we get—

Min.	0	1	2	3	4	5	6	7	8	9	10
Pos.	2	2	3	1	3	1	0	4	2	0	1
Neg.	1	3	3	3	2	1	0	3	0	3	1
Sum.	3	5	6	4	5	2	0	7	2	3	(2)

which gives a small indication of clustering of a type previously noticed, viz., with a double maximum.

(β) BELATED RECORDS.

Records for Ootomari and Tokyo for 1918 were not received until a portion of the year had already been printed. The following observations were accordingly omitted from their proper place, but may be inserted in MS.:

Ootomari ($46^{\circ}39'N$. $142^{\circ}46'E$.).

Constants $A = -.546$, $B = +.415$, $C = +.727$.

Observations not received until the solutions for 1918 Jan.-June had been printed.

Date.	Epicentre.		Δ	P.	O-C.	S.	O-C.	L.	M.
d. h.	°	'	°	m. s.	s.	m. s.	s.	m.	m.
Jan. 30 21	47.5N.	129.0E.	9.4	1 30	-52	—	—	2.4	—
Feb. 4 17	29.6N.	87.8E.	45.4	17 21	?8	(17 21)	+120	23.0	23.4
Feb. 7 5	6.5N.	127.0E.	42.4*	7 59	+ 2	14 19	+ 9	17.4	17.5
Feb. 9 20	25.6N.	134.1E.	22.2	2 27	-160	—	—	4.2	4.3
Feb. 13 6	24.0N.	116.5E.	30.9	6 47	+10	11 47	- 3	14.2	15.4
Apr. 10 2	44.0N.	131.0E.	8.7†	2 34	+31	—	—	4.3	4.4
May 20 14	7.4N.	35.2W.	125.8	21 13	?PR ₁	—	—	—	—
May 20 18	29.6S.	71.5W.	151.5	16 34	-83	—	—	—	—
May 22 6	17.0S.	177.5W.	73.0+	11 7	+ 9	—	—	20.1	—
May 31 8	45.1N.	147.2E.	3.5	1 22	+27	—	—	2.6	—
June 1 8	38.5N.	146.0E.	8.5	3 46	?S	(3 46)	- 4	—	—

Tokyo ($35^{\circ}41'N$. $139^{\circ}45'E$. included in list).

Jan. 18 10	12.0N.	95.0E.	46.7	—	—	e 13 44	-113	—	—
Jan. 25 1	12.0N.	95.5W.	109.4	31 23	?	31 44	?	local ?	—
Jan. 30 21	47.5N.	129.0E.	14.3	2 27	-63	—	—	—	5.3
Feb. 7 5	6.5N.	127.0E.	31.4*	e 6 30	- 4	e 7 52	?	—	—
Feb. 9 20	25.6N.	134.1E.	11.2	2 21	-26	4 2	-57	—	4.6
Feb. 13 6	24.0N.	116.5E.	23.2	5 36	+17	7 57	-92	10.0	13.8
Mar 23 0	49.0N.	144.0E.	13.7	e 5 12	-49	—	—	—	—

* Correction for deep focus $-2^{\circ}2$ for Ootomari, $-1^{\circ}8$ for Tokyo.

† Correction for deep focus $-0^{\circ}6$. ‡ Correction for deep focus $-6^{\circ}0$.

(γ) CORRECTED EPICENTRES.

This additional information from Ootomari and Tokyo has suggested revision of adopted epicentres in three cases.

On 1918 Jan. 30d. 21h. 18m. 27s., both Ootomari and Tokyo give large negative residuals (—52s. and —63s.), thus confirming the other Japanese stations, and making it clear that a solution with focus at normal depth will not work. We must assume a focal depth of about 0.050. The only available confirmation from the antipodes is provided by the La Paz observation, $\Delta = 145^{\circ}9$, $iP = +18m.6s$. If this is a true P the residual is —31s., as in the text. But possibly it is [P] with residual —106s., or —46s. if we may assume an error of 1min., as suggested by the repetition on Feb. 9 below. The revised solution would give the following residuals for some representative stations:—

1918 Jan. 30d. 21h. 18m. 27s. Epicentre $45^{\circ}0N$, $135^{\circ}0E$.

$A = -500$, $B = -500$, $C = +707$; $D = +707$, $E = +707$;
 $G = -500$, $H = -500$, $K = -707$.

	Corr. for Focus	Δ	Az.	New Resids. P. s.	S.	Old Resids. P. s.	S.
Ootomari	-0.2	5.6	70	0	—	-52	—
Mizusawa	0.0	7.4	220	—	—	-71	—
Tokyo	-0.6	10.0	157	—	—	-63	—
Kobe	-0.6	10.3	179	+9	—	-46	—
Osaka	-0.6	10.3	178	+12	—	-44	—
Zi-ka-wei	-1.6	17.4	222	+12	-17	-8	-52
Taihoku	-2.3	22.7	213	+10	—	-27	—
Manila	-3.4	32.6	207	-3	-3	-44	-77
Calcutta	-4.4	45.0	258	-3	-9	-5	-14
Simla	-4.5	46.5	275	+4	+4	+1	-1
Bombay	-5.3	57.6	266	+6	-22	-2	+6
Batavia	-5.3	57.1	214	+12	—	-24	—
Honolulu	-5.5	59.0	89	+15	+30	-48	-89
Lemberg	-5.8	67.7	320	+19	+31	+11	+17
Berkeley	-5.9	71.8	53	+1	+2	-49	-91
Lick	-6.0	72.6	53	+1	+5	-49	-89
De Bilt	-6.0	73.8	330	+11	+16	0	-3
Eschdalemuir	-6.0	73.7	338	+8	+19	-5	-4
Uccle	-6.0	75.1	330	+5	+12	-5	-9
Athens	-6.0	76.1	311	+10	+21	0	0
Paris	-6.1	77.4	330	+8	+12	-4	-9
Milan	-6.1	77.6	325	-1	+10	-12	-12
Perth	-6.2	78.7	197	+29	—	-19	—
Adelaide	-6.2	80.2	178	—	+7	—	-95
Riverview	-6.2	80.9	167	-4	+133	-57	+29
Sydney	-6.2	80.9	167	—	-7	—	-111
Ottawa	-6.4	85.7	20	-6	-18	-37	-78
Northfield	-6.4	87.5	19	-1	-26	-30	-84
Georgetown	-6.5	91.3	24	-11	-44	-44	-106
Washington	-6.5	91.3	24	-12	-44	-44	-106

1918. Feb. 9d. 20h. 46m. 18s. Epicentre adopted in the text as $25^{\circ}6N$, $134^{\circ}1E$.; but this seems to be possibly a repetition of the above from the same deep focus, thus:—

Feb. 9d. 20h. 46m. 10s. Epicentre $45^{\circ}0N$, $135^{\circ}0E$.

	Corr.	Δ	Az.	Focal depth 0.050.		S.	O—C.
				P. m. s.	O—C. s.		
Ootomari	+0.2	5.6	70	2 35	?8	(2 35)	-4
Mizusawa	0.0	7.4	220	2 13	+21	3 48	+27
Tokyo	-0.6	10.0	157	2 29	+7	4 10	-3
Kobe	-0.6	10.3	179	2 18	-8	(3 50)	-31
Osaka	-0.6	10.3	178	2 25	-1	—	—
Zi-ka-wei	-1.6	17.4	222	3 13	-36	5 37	-73
Manila	-3.4	32.6	207	(5 38)	-42	5 38	?P
Batavia	-5.3	57.1	214	—	—	14 50	-111
Zagreb	-6.0	74.4	321	11 6	-1	—	—
Milan	-6.1	77.6	325	11 17	-10	—	—
Monte Cassino	-6.2	78.8	320	11 32	-2	—	—
Rocca di Papa	-6.2	79.1	321	11 30	-5	14 51	?PR ₁
La Paz	—	145.9	44	19 9	[-56]	—	—

The observations at Zi-ka-wei, Manila, and Batavia are discordant, but otherwise the fit is fairly satisfactory.

Mar. 23d. 0h. 11m. 50s. The Epicentre $49^{\circ}0N$, $144^{\circ}0E$. seems clearly erroneous, but it is not clear what change should be made. Apparently this is not a further repetition from $45^{\circ}0N$, $135^{\circ}0E$. above. The epicentre seems to be nearer that of April 10, viz., $44^{\circ}N$, $131^{\circ}E$., but without a deep focus. The best solution obtained was $42^{\circ}N$, $129^{\circ}E$., but it is necessary to assume one or two mistakes of minutes.

(δ) METHODS OF PROCEDURE.

Since the volume for 1918 begins a new series of this publication, it seems desirable to repeat here the explanation of the procedure formerly given in Appendix II to the Large Earthquakes of 1916.

If δ and λ be the latitude (North) and longitude (East) of an epicentre, then the following constants are usually printed for each epicentre :

$$\begin{array}{lll} A = \cos \delta \cos \lambda & B = \cos \delta \sin \lambda & C = \sin \delta \\ D = \sin \lambda & E = -\cos \lambda & \\ G = \sin \delta \cos \lambda & H = \sin \delta \sin \lambda & K = -\cos \delta \end{array}$$

With A, B, C, it is easy to find Δ for any station, and with either D, E, or G, H, K, to find Z, the azimuth of the station round the Epicentre (from North to East). For if d and l be the latitude (N) and longitude (E) of the station, and

$$a = \cos d \cos l, \quad b = \cos d \sin l, \quad c = \sin d,$$

then (see M.N.R.A.S. LXXV., p. 530).

$$\begin{aligned} 2 \operatorname{versin} \Delta &= (a - A)^2 + (b - B)^2 + (c - C)^2 \\ 2 + 2 \sin \Delta \sin Z &= (a - D)^2 + (b - E)^2 + c^2 \\ 2 + 2 \sin \Delta \cos Z &= (a - G)^2 + (b - H)^2 + (c - K)^2 \end{aligned}$$

The values of a , b , c for the stations are printed in a list which has been distributed.

For finding Δ from the first equation a table is given at the end of the paper cited. The Azimuth is usually found from both 2nd and 3rd equations, when Δ is less than 30° : but beyond 30° is often read from a globe, as it is not required with great accuracy.

Useful checks on the signs and values of the constants are

$$A = +KE, \quad B = -KD, \quad G = -CE, \quad H = +CD.$$



The International Seismological Summary for 1919.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number contains the information for January, February, and March, 1919, thus commencing the second year of the International Summary—the successor to the *Shide and Oxford Bulletins*.

Attention may be called to the following cases of “deep focus” :—

	Date.				Epicentre.	Focal Depth.
	d.	h.	m.	s.		
Jan.	1	3	0	0	20.5N. 178.5W.	+·030
Mar.	1	13	36	0	9.0N. 141.0E.	+·030
Mar.	2	3	26	40	43.7S. 77.0W.	+·020
		11	45	10		
		9	3	16 45		
	13	14	16	55	8.5S. 124.5E.	(Suggested)
	16	7	33	10	9.5N. 127.0E.	+·015
		15	3	0		

In some of these cases a discussion of the evidence is given : in others the figures are left to speak for themselves. Instances of abnormal focal depth are apparently not numerous, but they are steadily accumulating, and fuller discussion may be reserved until a sufficient number have been collected.

The welcome news has been received that the Russian Seismological Observatories are being revived, and a few records have been received from Ekaterinburg. Hence, though the number of stations sending records is already large in 1919 (the year of emergence from the War), we may apparently hope for an increase in subsequent years.

H. H. TURNER.

University Observatory, Oxford.
1923 December 21.

1919 JANUARY, FEBRUARY, & MARCH.

1919. Jan. 1d. 1h. 33m. 36s. Epicentre 5°·4N. 125°·2E.

(as on 1918 Oct. 26d. and on many previous occasions.)

A = -·574, B = +·813, C = +·094; D = +·817, E = +·576;

G = -·054, H = +·077, K = -·996.

The Epicentre, used so often before, has been retained for convenience of reference, but the residuals suggest one further north.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	10·1	336	e 2 48	+17	(4 13)	-19	4·2	—
Taihoku	19·9	350	4 44	+ 4	(8 3)	-18	8·0	12·5
Batavia	21·7	238	5 6	+ 5	i 9 29	+30	—	10·4
Zi-ka-wei	26·0	353	e 5 27	-21	9 50	-32	e 11·6	13·1
Nagasaki	27·7	8	5 49	-16	(10 14)	-40	10·2	12·4
Kobe	30·7	16	5 50	-45	—	—	13·6	14·3
Osaka	30·8	17	6 4	-32	(11 28)	-20	11·5	16·6
Tokyo	33·1	22	6 34	-23	7 18	?	13·6	14·0
Mizusawa	E. 36·6	21	6 56	-31	12 29	-49	—	—
Calcutta	E. 39·5	299	7 48	- 3	14 0	+ 1	20·4	29·0
	N. 39·5	299	7 48	- 3	13 54	- 5	20·0	—
Adelaide	42·3	163	8 16	+ 3	14 24	-15	19·6	31·4
Ootomari	43·9	17	8 8	-17	14 3	-58	17·5	22·4
Colombo	45·2	274	7 42	-52	9 18	?	13·7	14·3
Riverview	46·3	150	e 8 48	+ 6	15 20	-12	e 20·9	24·3
Sydney	46·3	150	8 54	+12	16 30	+58	24·8	27·4
Melbourne	46·9	159	8 48	+ 2	15 48	+ 8	19·4	19·9
Kodaikanal	47·5	277	8 42	- 9	(15 54)	+ 6	15·9	16·4
Simla	51·8	306	e 8 48	-31	16 6	-35	21·1	24·3
Bombay	52·8	290	9 31	+ 6	17 6	+12	—	18·8
Apia	65·4	108	e 10 48	+ 1	e 19 24	- 6	29·1	35·4
Ekaterinburg	71·8	329	i 11 12	-16	i 20 18	-30	29·4	—
Honolulu	75·8	69	11 48	- 6	21 36	+ 1	34·7	48·7
Helwan	90·7	298	13 0	-20	—	—	—	—
Lemberg	93·0	321	e 13 18	-14	i 23 57	-48	e 46·8	63·5
Athens	95·7	309	e 13 36	-11	i 24 14	-59	—	—
Vienna	Z. 98·2	320	e 13 45	-16	i 24 33	-65	e 43·4	—
Victoria	99·9	39	13 56	-14	24 17	-98	38·2	67·5
Hamburg	100·2	326	e 14 16	+ 4	i 24 37	-81	e 42·0	60·5
Pola	100·9	318	i 24 42	?S	(24 42)	-82	e 60·7	64·2
Pompeii	101·9	314	18 18	?PR ₁	24 44	-90	33·5	54·4
Monte Cassino	102·1	315	—	—	24 47	-89	—	24·9
Rocca di Papa	102·8	315	e 14 11	-13	24 42	-100	e 39·1	—
Florence	103·1	318	14 46	+20	—	—	—	—
De Bilt	E. 103·4	327	14 9	-18	i 24 53	-95	e 47·4	68·2
	N. 103·4	327	—	—	—	—	e 45·4	58·8
Zurich	103·5	321	—	—	i 24 53	-96	—	—
Strasbourg	103·5	321	e 14 24	- 4	i 24 54	-95	e 43·4	—
Berkeley	104·0	49	18 24	?PR ₁	—	—	—	—
Dyce	104·3	333	—	—	e 24 58	-98	43·4	64·4
Uccle	104·4	326	14 18	-14	24 57	-100	e 44·4	49·5
Lick	104·7	50	—	—	e 23 24	-195	—	—
Moncalieri	105·0	320	e 14 16	-18	24 53	-109	39·8	45·7
Besangon	105·2	322	25 2	?S	(25 2)	-102	—	—
Edinburgh	105·6	332	14 24	-13	—	—	—	—
Eskdalemuir	105·9	331	14 11	-28	26 23	-28	49·9	51·4
Paris	106·5	325	e 18 24	?PR ₁	i 25 9	-108	34·4	34·4
Kew	106·6	328	23 24	?S	—	—	—	—
Cape Town	106·9	236	15 12	+28	25 12	-108	51·2	54·7
Bidston	107·0	331	20 54	?PR ₁	26 21	-40	—	63·4
	107·0	331	—	—	i 25 6	-115	45·4	60·9
Oxford	107·0	328	—	—	i 25 10	-111	—	67·4
Shide	107·6	326	14 24	-22	i 25 12	-114	—	67·4
Dublin	108·6	334	—	—	i 25 6	-129	44·9	—
Barcelona	110·1	318	e 19 12	?PR ₁	i 25 21	-128	39·4	62·4
Algiers	111·6	313	19 7	?PR ₁	29 2	+80	46·4	72·4
Tortosa	111·6	318	19 37	?PR ₁	28 46	+64	40·3	62·9

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Granada	116.1	316	25 30	?S	e 35 28	?SR ₁	—	—
Coimbra	117.7	322	20 5	?PR ₁	29 45	+73	46.2	66.0
Rio Tinto	117.8	318	22 24	?	—	—	—	—
San Fernando	118.3	317	29 36	?S	(29 36)	+60	68.9	82.9
Chicago	124.2	29	20 37	?PR ₁	30 14	+54	50.4	—
Ann Arbor	E. 125.6	26	20 18?	?PR ₁	—	—	46.4	—
Ottawa	N. 125.8	18	i 20 51	?PR ₁	e 30 8	-36	62.4	—
Toronto	126.2	22	—	—	e 30 6	+32	63.2	82.5
Northfield	127.9	16	—	—	—	—	e 66.4	—
Ithaca	N. 128.3	20	e 22 40	?PR	e 31 9	?	e 48.6	—
Harvard	E. 128.3	20	e 22 41	?PR ₁	e 32 44	?	56.4	—
Georgetown	N. 130.0	16	—	—	20 15?	?PR ₁	e 51.5	63.3
Washington	E. 131.1	23	e 22 42	?PR ₁	—	—	59.4	—
Cheltenham	N. 131.1	23	e 22 43	?PR ₁	—	—	59.7	—
	E. 131.1	23	e 19 19?	[-2]	e 22 30	?PR ₁	66.9	—
Cipolletti	N. 131.3	23	23 19	?PR ₁	—	—	64.2	83.3
Balboa Heights	E. 131.3	23	23 23	?PR ₁	—	—	64.1	83.9
Pilar	144.3	162	17 6	-22	—	—	73.1	109.8
Adagala	151.4	60	19 24	[-34]	—	—	—	—
Rio de Janeiro	152.4	163	20 42	[+43]	—	—	—	—
La Paz	155.2	155	22 24	?	—	—	83.1	—
	159.2	212	—	—	—	—	e 77.0	—
	162.8	131	20 15	[+ 5]	34 17	?	73.5	90.2

Additional records: Batavia gives $L = +27.4m.$, $T_0 = 1h.33m.11s.$, Zi-ka-wei
PSE = +10m.9s., PSN = +10m.25s., SR₁E = -11m.8s., MN = -15.3m.,
 $T_0 = 1h.33m.32s.$, Osaka MN = +15.6m., Mizusawa SN = +12m.25s.,
 $T_0 = 1h.33m.37s.$, Adelaide PR₁ = +9m.56s., SR₁ = +16m.39s., SR₂ =
+17m.49s., Riverview iP = +8m.54s., iPR₁ = +10m.37s., i = +15m.24s.,
and -15m.35s., iPS = +16m.11s., i(SR₂?) = +18m.43s., MZ = +25.9m.,
 $T_0 = 1h.34m.9m.$, Sydney PS = +15m.42s.(?S), SR₂ = +21m.54s., Dehra
Dun ($\Delta = 50^{\circ}.8$) gives records at 1h.17m. and 2h.16m.30s., Apia eSR₁ =
+23m.24s., $T_0 = 1h.33m.49s.$, Hamburg ePR₁ = +18m.5s., MN = +54.8m.,
De Bilt PR₁ = +18m.25s., eE = +34m.19s., $T_0 = 1h.34m.59s.$, Epicentre
 $8^{\circ}.0N. 127^{\circ}.0E.$, Dyce PR₁ = +18m.56s., iS = +25m.8s., Eskdalemuir
PR₁ = +18m.38s., Paris i = +26m.24s., Bidston eS = +24m.53s.,
Oxford PR₁ = +18m.47s., eS = +25m.5s., Shide PR₁ = +18m.46s., eS =
+25m.2s., Barcelona eLN = +51.0m., eLE = +49.6m., Algiers
i = +25m.30s., M = +56.4m., San Fernando MN = +86.4m., Chicago
L = +73.4m., Ann Arbor PN = +20m.54s., Ottawa eL? = +52.4m.,
L = +66.4m., Toronto eL = +36.5m., L = +80.1m., Northfield
LE = +84.9m., Ithaca eE = +38m.4s., eN = +38m.29s., LE = +64.9m.,
Harvard eE = +46m.6s., L = +58.8m., M = +67.7m., Georgetown
eL = +51.5m., Washington eL? = +33.4m., L = +81.4m.

1919. Jan. 1d. 3h. 0m. 0s. Epicentre 20.5S. 178.5W.

A = -.936, B = -.025, C = -.350; D = -.026, E = +1.000;
G = +.350, H = +.009, K = -.937.

A focal depth of 0.030 has been assumed.

Station and Component.	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Apia	-0.4	9.2	45	i 2 5	- 8	—	—	2.6	38.0
Riverview	-2.0	29.9	235	e 6 11	4	i 11 1	+ 4	e 13.3	14.2
Sydney	-2.0	29.9	235	6 42	-35	6 42	?P	18.5	19.8
Melbourne	-2.3	36.0	231	(7 36)	+34	7 36	?P	14.8	17.6
Adelaide	-2.5	40.3	239	7 35	- 1	13 25	-10	15.9	18.4
Honolulu	-2.9	46.3	26	e 7 36	-45	—	—	14.5	15.0
Tokyo	-3.8	68.7	324	10 50	- 6	11 15	?	—	20.8
Manila	-3.8	69.1	296	e 10 50	+ 3	(e 19 42)	+13	39.4	41.7
Osaka	-3.8	70.4	321	10 55	0	20 14	+29	28.0	30.6
Kobe	-3.8	70.6	321	10 56	- 1	(19 57)	+ 9	20.0	21.0
Mizusawa	E. -3.8	70.6	329	10 44	-13	19 48	0	—	—
Nagasaki	N. -3.8	70.6	329	10 52	- 5	19 55	+ 7	—	—
Batavia	-3.9	72.6	317	11 4	- 5	(20 18)	+ 8	20.3	21.0
Taihouku	-3.9	73.5	270	i 11 34	+19	i 21 9	+48	49.0	22.0
Ootomari	-3.9	73.9	306	(11 28)	+11	(20 53)	+27	20.9	33.0
Zi-ka-wei	-3.9	75.7	334	11 27	- 1	(21 9)	+21	21.2	—
Berkeley	E. -3.9	77.4	311	11 34	- 5	20 24	-44	e 32.6	—
	-4.0	78.6	41	e 11 45	- 1	e 21 16	- 5	—	25.0
	N. -4.0	78.6	41	e 11 41	5	e 21 15	- 6	—	21.5

Continued on next page.

Station and Component.	Corr. for Focus	Δ	Az.	P.		O-C.		S.		O-C.		L.	M.
				m.	s.	s.	s.	m.	s.	s.	s.	m.	m.
Lick		-4.0	78.8	42	e 11	42	- 6	e 21	22	- 2	—	—	21.5
	Z.	-4.0	78.8	42	e 11	37	-11	e 21	25	- 1	—	—	—
Tucson		-4.1	83.4	51	12	28	-13	22	20	- 5	—	—	22.5
Victoria		-4.1	84.6	32	11	0	-82	13	19	?	17.3	—	22.7
	Z.	-4.1	84.6	32	11	12	-70	13	4	?	—	—	26.0
Sirka	F.	-4.1	85.4	21	12	12	-15	22	37	- 1	(e 34.9?)	—	22.8
	N.	-4.1	85.4	21	12	1	-26	22	34	- 4	(e 34.9?)	—	28.4
Cipolletti		-4.2	91.9	133	—	—	—	—	—	—	—	—	58.3
Pilar	E.	-4.4	98.5	130	18	12	? PR ₁	(23 36)	—	-81	23.6	27.8	—
	N.	-4.4	98.5	130	18	12	? PR ₁	(23 48)	—	-69	23.8	27.7	—
Andagala	E.	-4.4	98.7	125	15	18	+98	(25 36)	—	-37	25.6	61.1	—
	N.	-4.4	98.7	125	14	54	-74	(25 36)	—	-37	25.6	54.3	—
Caleutta		-4.4	100.5	290	15	18	+88	23 54	—	-83	31.8	—	—
Balboa Heights		-4.4	101.4	85	16	0	+126	—	—	—	—	—	—
La Paz		-4.4	102.2	114	i 14	4	+ 5	i 24	4	-90	(39.6)	43.3	—
Colombo		-4.5	103.3	272	—	—	—	—	—	—	23.0	25.4	—
Chicago		-4.5	104.1	50	15	27	+78	22	30	-202	29.0	—	—
Kodaikanal		-4.5	106.6	275	—	—	—	—	—	—	—	23.8	—
Ann Arbor	E.	-4.5	107.0	50	18	0?	? PR ₁	23	30	-170	26.0	27.0	—
	N.	-4.5	107.0	50	17	42	? PR ₁	22	12?	-248	26.2	—	—
Toronto		-4.6	110.4	49	(16 12)	—	-94	16	12	? P	29.4	31.9	—
Georgetown	E.	-4.6	111.3	54	e 17	57	? PR ₁	24	37	-141	e 28.2	—	—
	N.	-4.6	111.3	54	e 18	17	? PR ₁	26	39	-19	e 28.7	—	—
Washington		-4.6	111.3	54	17	44	? PR ₁	24	42	-136	28.7	—	—
Cheltenham	E.	-4.6	111.5	55	19	20	? PR ₁	25	12	-108	29.2	35.3	—
	N.	-4.6	111.5	55	19	53	? PR ₁	26	59	- 1	—	34.9	—
Simla		-4.6	112.3	297	e 19	0	? PR ₁	26	18	-49	34.2	—	—
Ithaca	E.	-4.6	112.3	50	e 19	20	? PR ₁	e 27	45	-38	37.0	—	—
	N.	-4.6	112.3	50	e 18	50	? PR ₁	e 22	5	?	—	—	—
Ottawa		-4.6	113.2	47	19	10	? PR ₁	i 26	37	-38	e 28.5	—	—
Bombay		-4.6	113.4	282	18	33	? PR ₁	—	—	—	—	—	—
Northfield		-4.7	115.3	49	e 19	30	? PR ₁	26	54	-39	65.5	—	—
Harvard	E.	-4.7	116.2	51	e 20	30	? PR ₁	27	17	-25	e 34.5	67.0	—
	N.	-4.7	116.2	51	e 20	24	? PR ₁	27	41	- 1	—	36.0	—
Vieques	N.	-4.7	117.2	79	19	18	? PR ₁	30	6	-136	35.6	35.8	—
	E.	-4.7	117.2	79	19	15	? PR ₁	29	19	+89	35.6	30.1	—
Rio de Janeiro		-4.7	118.5	132	—	—	—	(26 18)	—	-102	26.3	29.9	—
Cape Town		—	123.3	197	—	—	—	—	—	—	37.3	40.5	—
Ekaterinburg		—	123.8	325	i 18	20	[-43]	—	—	—	—	—	—
Dyce		—	143.2	2	e 19	38	[-7]	29	13	-129	—	—	—
Edinburgh		—	144.5	3	—	—	—	—	—	—	—	40.7	—
Lemberg		—	145.7	332	i 19	12	[-37]	21	18	? PR ₁	e 67.2	69.4	—
Hamburg	E.	—	146.3	350	i 19	20	-30	i 29	23	-136	—	41.6	—
	N.	—	146.3	350	i 19	17	-33	i 33	30	+111	—	47.2	—
Dublin		—	146.6	9	19	20	-31	41	28	? SR ₁	—	—	—
Bidston		—	146.9	3	21	42	? PR ₁	34	36	+174	—	64.1	—
		—	146.9	3	19	14	-37	29	5	-157	i 41.5	—	—
Ascension		—	147.6	150	19	0	-52	—	—	—	—	28.6	—
De Bilt		—	148.0	354	i 19	23	-30	i 29	35	?	i 47.6	—	—
Oxford		—	148.6	2	19	24	-30	i 41	50	? SR ₁	—	—	—
Kew		—	149.0	2	—	—	—	—	—	—	—	41.0	—
Uccle		—	149.5	356	e 19	19	[-36]	e 29	24	?	—	—	—
		—	149.5	356	i 19	25	-30	i 29	41	?	—	—	—
Shide		—	149.7	3	19	27	-28	i 41	58	? SR ₁	—	—	—
Vienna	Z.	—	149.8	340	i 19	23	-33	e 19	50	?	e 47.6	89.9	—
Helwan		—	151.5	295	—	—	—	—	—	—	—	56.6	—
Strasbourg		—	151.5	351	e 19	25	[-33]	i 42	17	?	—	—	—
Paris		—	151.7	359	i 19	33	-25	i 29	52	?	—	62.0	—
Zurich		—	152.5	350	e 19	25	-35	—	—	—	—	—	—
Besaçon		—	153.0	353	19	48	-12	29	48	?	43.0	—	—
Pola		—	153.6	340	i 20	18	+17	30	18	?	e 34.3	43.0	—
Athens		—	154.1	317	e 19	31	-30	i 26	26	? PR ₁	e 36.3	—	—
Moncalieri		—	155.0	350	e 19	39	-23	28	30	?	38.0	46.2	—
Florence		—	155.3	343	19	54	- 8	30	14	?	37.4	47.0	—
Monte Cassino		—	156.6	336	19	43	-21	—	—	—	—	36.0	—
Rocca di Papa		—	156.7	339	19	54	-10	30	3	?	e 51.0	63.1	—
Pompeii		—	156.9	334	19	48	-17	30	8	?	43.0	55.0	—
Coimbra	F.	—	158.5	21	19	55	-12	29	37	?	i 43.6	49.8	—
	N.	—	158.5	21	20	7	0	30	27	?	i 43.7	50.1	—
Barcelona		—	159.0	359	19	49	-18	30	21	?	32.5	50.0	—
Tortosa		—	159.7	2	19	43	-25	29	30	?	43.4	50.5	—
Rio Tinto		—	161.4	20	—	—	—	—	—	—	—	48.0	—
Granada		—	162.7	14	19	37	[-33]	30	22	?	—	—	—
Algiers		—	163.7	356	19	58	[-13]	30	45	?	45.0	—	—

For Notes see next page.

NOTES TO JAN. 1d. 3h. 0m. 0s.

Additional records: Riverview gives $iP = +6m.13s.$, $i = +6m.47s.$, $iPR_1 = +7m.18s.$, $iPR_2 = +7m.58s.$, $iS = +11m.16s.$, $MZ = +14.3m.$, $T_0 = 3h.0m.9s.$, Epicentre $22^\circ 08'. 179^\circ 5'W.$ Sydney $SR_2 = +13m.0s.$, P is given as S and $P = 2h.58m.18s.$ Melbourne $SR_1 = +11m.0s.$, $SR_2 = +12m.12s.$ Adelaide $PR_1 = +9m.10s.$, $PR_2 = +9m.55s.$ Manila gives the S and L recorded above as Ps of separate shocks, also $L? = +12m.55s.$ and $L = +40m.47s.$ Osaka $MN = +31.8m.$, $T_0 = 2h.59m.35s.$ Kobe $MN = +20.1m.$ Taihoku $L = +12.0m.$ Ootomari $S = +17m.53s.$, $\{PR_1$, Zi-ka-wei $PSE = +21m.30s.$, $PSN = +21m.44s.$, $SR_1E = +25m.52s.$, $LE = +33.1m.$, $T_0 = 3h.0m.39s.$ Sitka gives two sets of $e?$ records: $eN = +28m.14s.$, $eE = +28m.18s.$, and the two sets given as L in the table. Pilar $P = +3m.36s.$ La Paz $PR_1 = +18m.11s.$, $SR_1 = +27m.39s.$ Toronto $L? = +25.9m.$, $i = +28m.48s.$ and other $Ls.$ Georgetown $iE = +30m.20s.$, $iN = +34m.20s.$ and $+38m.30s.$ Washington $L = +32.0m.$ and $+39.5m.$ Ithaca $eE = +24m.45s.$ Ottawa $eSE? = +24m.8s.$, $iN = +29m.24s.$, $+34m.38s.$, $+38m.40s.$, also several $Ls.$ $T_0? = 3h.12m.55s.$ Northfield $L = +28.8m.$ Harvard $PR_1N = 20m.56s.$, $PR_1E = +20m.57s.$, $eE = +22m.34s.$, $SR_1N = +30m.59s.$, $T_0 = 3h.11m.43s.$ Dyce $iP = +19m.46s.$, $PR_1 = +22m.57s.$ Lemberg $i = +19m.39s.$, $M_1 = +20.2m.$ Bidston $PR_1 = +23m.6s.$ De Bilt $iE = +41m.44s.$, $mN = +48m.10s.$, $mE = +55m.3s.$ Uccle $i_1 = +21m.13s.$, $i(PR_1) = +23m.23s.$, $i_2 = +33m.39s.$, $i_3 = +42m.0s.$ Strasbourg $iN = +42m.25s.$ Zurich $i = +19m.33s.$ Athens $i = +19m.58s.$ Moncalieri $i = +19m.52s.$, $MN = +50.3m.$ Monte Cassino, P may be one hour late. Pompeii, manuscript record $L = +43.8m.$ Coimbra $iN = +46m.31s.$, $iE = +46m.33s.$ Barcelona $PR_1 = +24m.23s.$, $PR_2 = +25m.53s.$, $PR_3 = +27m.59s.$, $iE = +37m.18s.$ Algiers $PR_1 = +24m.46s.$, $i = +35m.8s.$

Jan. 1d. Records also at 0h. (Zi-ka-wei), 1h. (Manila), 4h. (La Paz and Mizusawa), 5h. (Bombay, Batavia, and La Paz), 6h. (Taihoku and Manila), 7h. (Helwan and Manila), 14h. (Mizusawa and La Paz), 16h. (Manila, De Bilt, and Ekaterinburg), 18h. (La Paz), 20h. (San Fernando), 21h. (Paris).

Jan. 2d. Records at 0h. (Ekaterinburg and Taihoku), 3h. (San Fernando), 8h. (Athens), 13h. (Manila), 14h. (La Paz and Athens), 19h. (La Paz), 21h. (Athens, De Bilt, Helwan, and Vienna), 22h. (Manila), 23h. (Helwan and Athens).

Jan. 3d. Records at 0h. (Manila, San Fernando, and Nagasaki), 2h. (Andalgala), 3h. (La Paz, Mizusawa, and Zi-ka-wei), 4h. (Manila, Helwan, Ekaterinburg, De Bilt, and Bidston), 6h. (Zi-ka-wei and Taihoku), 8h. (Uccle and Strasbourg), 16h. (La Paz), 19h. (Ekaterinburg), 22h. (Ascension), 23h. (Manila).

Jan. 4d. 14h. 17m. 37s. Epicentre $5^\circ 4'N. 125^\circ 2'E.$ (as on 1919 Jan. 1d.).

$$A = -574, B = +813, C = +094.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	10.1	e 2 41	+10	—	—	4.0	5.6
Batavia	21.7	e 5 1	0	—	—	—	12.5
Zi-ka-wei	26.0	e 5 27	-21	e 10 1	-21	—	—
Rocca di Papa	102.8	—	—	e 31 48	?SR ₁	—	33.8

Manila gives also $MN = +4.8m.$

Jan. 4d. Records also at 1h. (Melbourne and Riverview), 2h. (Helwan, Rocca di Papa, San Fernando, and Manila), 3h. (Athens (2) and Zurich), 4h. (Lick), 5h. (La Paz and Batavia), 9h. (Tokyo, Ootomari, Mizusawa, and Pompeii), 20h. (Zi-ka-wei), 21h. (Zi-ka-wei and Riverview).

Jan. 5d. 15h. 25m. 30s. Epicentre $10^{\circ}0'N$, $20^{\circ}0'E$. (as on 1918 April 27d. 10h.).

$$A = +.720, B = +.262, C = +.643; \quad D = +.342, E = -.940; \\ G = +.604, H = +.220, K = -.766.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Athens	3.6	123	6 57	1	1 12	3	2.1	2.6
Pompeii E.	4.2	281	e 1 5	0	e 2 7	12	—	2.7
Monte Cassino	4.9	290	1 8	- 8	—	—	—	2.9
Rocca di Papa	5.8	291	e 1 15	-15	—	—	—	3.7
Pola	6.6	319	e 2 31	?S	(e 2 31)	-29	e 3.6	4.8
Florence	7.5	303	2 9	+15	—	—	—	5.1
Vienna	8.6	344	e 3 7	+57	e 4 51	+58	5.4	6.1
Moncalieri	10.3	303	e 3 24	+50	5 2	25	6.4	8.0
Strasbourg	12.2	318	—	—	e 4 50	-34	—	—
Helwan	13.7	134	7 30	?L	—	—	(7.5)	—
Hamburg	15.2	337	e 3 30	-12	—	—	e 8.2	10.9
Paris	15.2	311	—	—	—	—	e 8.5	11.5
Uccle	15.3	320	—	—	—	—	e 8.4	—
De Bilt	15.8	325	—	—	—	—	e 8.5	9.1
Eskdalemuir	21.7	322	—	—	—	—	11.3	—
Edinburgh	22.0	324	2 30	?	—	—	(12.5?)	14.5
Ekaterinburg	31.1	44	e 5 51	-48	e 10 55	-58	15.5	19.2

Additional records: Vienna gives MN = +5.7m. Moncalieri MN = +9.8m.
Hamburg MN = +11.3m. De Bilt MN = +9.2m. Pola and Monte
Cassino give their records at 16h., Central European time. Edinburgh
P may be 10min. too small.

1919. Jan. 5d. 19h. 51m. 40s. Epicentre $29^{\circ}6'S$, $71^{\circ}5'W$.

(as on 1918 May 20d.).

$$A = +.276, B = -.823, C = -.494; \quad D = -.948, E = -.317; \\ G = -.157, H = +.468, K = -.870.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Andalgala E.	5.0	67	4 38	?	—	—	5.3	6.6
N.	5.0	67	4 56	?	—	—	5.7	6.4
Pilar E.	6.9	110	2 44	?S	(2 44)	-23	4.8	6.1
La Quiaca E.	9.1	36	5 56	?L	—	—	8.0	8.8
N.	9.1	36	6 8	?L	—	—	(6.1)	9.0
Cipolletti	9.8	164	4 44	?S	(4 44)	+21	5.8	7.8
La Paz	13.4	14	3 12	- 6	5 23	-30	6.3	8.2
Rio de Janeiro	26.2	32	e 6 20	+30	15 2	?L	(15.0)	18.1
Ascension	57.5	81	45 20	?	51 20	?	—	—
Georgetown	68.7	355	e 11 20	+11	18 31?	-99	—	—
Chicago	72.9	350	20 39	?S	(20 39)	-22	43.8	—
Cape Town	74.0	121	20 20	?S	(20 20)	-54	—	39.8
Ottawa	75.1	357	—	—	i 21 27	0	e 43.3	—
Berkeley	82.4	322	—	—	—	—	e 43.0	—
San Fernando E.	90.1	47	27 20	?S	(27 20)	+185	—	63.3
Victoria	90.8	328	—	—	—	—	48.3	51.8
Coimbra	91.1	43	—	—	e 48 18	?L	51.3	—
Honolulu	97.5	291	e 25 44	?S	(25 44)	+13	46.3	52.3
Kew	102.1	38	—	—	—	—	—	63.3
Paris	102.4	40	—	—	e 53 20	?L	(58.3)	62.3
Eskdalemuir	102.8	34	—	—	—	—	45.3	—
Edinburgh	103.2	34	27 50	?S	(27 50)	+84	—	59.3
Moncalieri	103.6	46	—	—	e 26 8	-21	52.9	—
Uccle	104.4	39	—	—	—	—	—	61.3
Riverview	104.8	218	—	—	—	—	e 48.2	57.2
Florence	105.1	49	—	—	—	—	48.3	64.3
De Bilt	105.4	39	—	—	e 27 57	+71	52.3	58.8
Hamburg	108.6	38	—	—	—	—	e 59.3	—
Mauritius	110.2	130	55 14	?L	—	—	(55.2)	—
Helwan	114.3	69	20 20	?PR ₁	—	—	—	72.0
Ekaterinburg	137.1	37	i 19 40	[+ 6]	i 32 12	+85	59.3	82.6
Batavia	144.2	178	e 20 34	[+ 47]	—	—	—	21.2
Colombo	144.8	124	84 20	?L	—	—	(84.3)	93.3
Manila	161.1	220	—	—	e 31 56	?	—	—
Taihoku	167.6	252	—	—	37 51	?	(56.4)	—

Additional records: Pilar gives MN = +6.4m. La Paz T_0 = 19h.52m.11s.
Rio de Janeiro e = +7m.26s., L = +16.8m. and +17.8m. Chicago
S = +28m.45s., ?SR₁, L = +46.7m. San Fernando PN = 17h.54m.0s.,
MN = +62.3m. Riverview MN = +60.2m. De Bilt MN = +62.3m.,
 T_0 = 19h.52m.11s. Ekaterinburg i = +22m.9s. and +23m.15s.
Taihoku L = +38.1m. The L in the table is the PS of a supposed second
shock.

Jan. 5d. Records also at 6h. (Nagasaki), 9h. (Tokyo), 21h. and 22h. (Taihoku).

1919. Jan. 6d. 22h. 24m. 10s. Epicentre 11° 7'S. 162° 5'E.

(as on 1918 Mar. 19d.).

A = -034, B = +294, C = -203; D = -301, E = +954;
G = +193, H = -061, K = -979.

	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	24.4	203	i 5 32	0	i 9 46	- 6	e 11.9	14.9
Apia	25.1	98	5 44	5	—	—	11.8	13.2
Melbourne	30.5	208	6 32	- 1	11 50	- 7	15.7	16.8
Adelaide	31.8	219	6 30	-15	11 32	-33	15.8	17.8
Manila	48.9	302	e 9 2	+ 3	15 16	-49	19.0	21.0
Honolulu	50.9	49	8 32	-40	15 50	-40	e 22.7	30.8
Tokyo	52.0	338	—	—	e 16 7	-37	—	—
Osaka	53.0	332	9 16	-10	16 35	-21	22.6	28.8
Taihoku	54.3	314	e 9 32	- 3	—	—	25.8	27.5
Mizusawa	E. 54.6	340	9 29	- 8	15 48	-88	—	—
	N. 54.6	340	9 43	- 6	16 24	-52	—	—
Batavia	55.2	272	9 33	- 7	—	—	29.7	21.0
Zi-ka-wei	58.3	320	e 9 49	-12	e 17 31	-32	—	—
Colombo	84.3	278	19 50	?	—	—	—	63.8
Berkeley	85.8	50	—	—	e 23 25	- 3	—	—
Lick	86.0	51	—	—	—	—	e 40.8	—
Kodaikanal	E. 87.3	281	23 14	? (23 14)	—	-30	56.1	63.8
Victoria	88.5	40	23 45	? (23 45)	—	-13	39.5	52.3
	Z. 88.5	40	—	—	—	—	41.8	46.8
Bombay	93.5	289	16 50	?PR ₁	—	—	—	—
Mauritius	E. 99.4	247	39 56	?	—	—	53.0	54.2
	N. 99.4	247	43 26	?L	—	—	(43.4)	52.7
Ekaterinburg	106.3	326	e 18 15	?PR ₁	i 27 20	+25	47.8	52.9
Cipolletti	110.7	140	58 44	?L	—	—	68.3	70.9
Chicago	112.5	49	—	—	e 52 50	?L	56.8	—
Toronto	118.3	46	—	—	—	—	62.4	69.0
Ottawa	120.4	44	—	—	—	—	e 61.8	—
Washington	120.9	51	—	—	—	—	e 66.3	—
Cape Town	123.0	216	29 44	?S	(29 44)	+32	—	68.4
Harvard	124.4	46	—	—	55 33	?	62.3	—
Helwan	131.3	300	21 50	?PR ₁	—	—	—	—
Hamburg	132.8	339	—	—	—	—	e 58.8	73.8
Edinburgh	134.4	348	52 50	?L	—	—	(52.8)	88.3
De Bilt	E. 135.7	340	—	—	e 39 44	?	e 58.8	62.3
	N. 135.7	340	—	—	e 46 32	?	—	78.0
Bidston	136.7	347	23 20	?PR ₁	28 26	-138	—	49.6
Uccle	137.0	340	—	—	—	—	—	72.8
Kew	137.9	344	71 50	?L	—	—	(71.8)	121.8
Paris	139.3	340	—	—	—	—	e 72.8	80.8
Florence	139.5	329	50 50	?L	—	—	(50.8)	70.8
Moncalieri	140.4	332	e 37 53	?	50 48	?	68.7	85.9
Tortosa	146.9	335	19 43	{ - 8}	—	—	74.8	88.0
Algiers	148.8	324	—	—	—	—	e 80.8	85.3
San Fernando	153.3	340	(37 20)	?	—	—	83.8	110.3

Additional records: Riverview gives $eP = +5m.25s.$, $PR_1 = +6m.37s.$, $PS = +10m.4s.$, $MN = +13.8m.$, $MZ = +17.9m.$, $T_0 = 22h.24m.3s.$, and assigns the epicentre $12^\circ 0'S. 163^\circ 0'E.$ Apia $e_1 = +4m.2s.$ Adelaide gives $PR_1 = +7m.47s.$, $SR_1 = +13m.50s.$, $M_2 = +20.0m.$ Manila $MN = +20.8m.$ Osaka $MN = +30.1m.$, $T_0 = 22h.24m.15s.$ Victoria records S as P and gives $S = +29m.39s.$ Ekaterinburg $S = +25m.35s.$ Chicago $L = 60.8m.$ and $+66.8m.$ Toronto $eL = +66.3m.$ and $+74.4m.$ Ottawa $L = +85.8m.$ and $+100.8m.$ Cape Town $S = -38m.32s.$ (?SR₁). Harvard gives a fictitious T_0 ? at $23h.4m.15s.$; also $LE = +66.7m.$ Hamburg $MN = +79.8m.$ Eskdalemuir ($\Delta = 135^\circ 0'$) gives $23h.0m.$ to $0h.50m.$ De Bilt gives as epicentre $12^\circ 0'S. 163^\circ 0'E.$ Paris $MN = +76.8m.$ San Fernando $MN = +109.8m.$; P is given an hour too soon. Riverview, Apia, and Zi-ka-wei record their observations as on 7d.

Jan. 6d. Records also at 0h. (Mizusawa), 1h. (La Paz), 2h. (Helwan), 3h. (Taihoku), 7h. (Taihoku), 18h. (Hokoto, San Fernando, and Taihoku (2)), 20h. (Sydney and Perth), 22h. (Mizusawa), 23h. (La Paz).

Jan. 7d. Records at 0h. (Rio Tinto, Toronto, Harvard, and Victoria), 2h. (Moncalieri and Colombo), 4h. (Riverview), 12h. (Honolulu), 15h. (Taihoku), 18h. (Zi-ka-wei), 22h. (Zi-ka-wei, Apia, and Riverview, but these have been entered in the table for 6d. 22h., and assumed given for the wrong day), 23h. (Helwan and La Paz (2)).

Jan. 8d. 1h. 46m. 50s. Epicentre $25^{\circ}0'N$, $46^{\circ}0'W$.

$A = +.630$, $B = -.652$, $C = +.423$; $D = -.719$, $E = -.695$;
 $G = +.294$, $H = -.304$, $K = -.906$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Harvard	27.0	316	—	—	8 1	?	e 11.1	—
Washington	29.6	305	—	—	—	—	e 14.2	—
Georgetown E.	29.6	305	—	—	e 11 27	+ 0	e 14.2	—
Ottawa	31.1	319	—	—	e 11 28	-25	e 14.2	—
Toronto	33.0	316	—	—	—	—	16.3	21.2
Ann Arbor	35.5	311	—	—	—	—	—	19.2
San Fernando	35.8	61	13 58	?S	(13 58)	+51	—	21.7
Chicago	38.1	309	(8 30)	+51	8 30?	?P	19.2	—
La Paz	46.8	210	8 41	-5	15 39	+ 1	22.3	26.6
De Bilt	46.9	42	—	—	—	—	e 20.2	22.9
Florence	49.7	51	—	—	—	—	—	24.2
Victoria	63.4	315	30 18	?L	—	—	34.8	37.7
Cape Town	85.0	131	39 4	?L	—	—	(39.1)	41.7
Honolulu	99.4	300	—	—	—	—	e 50.2	56.4

Additional records: Harvard LN = $-18.2m$. Toronto gives eL = $+18.6m$.
 San Fernando MN = $+18.7m$. Chicago P? = 1h.45m.45s. and eL? = $+14.2m$.
 La Paz T₀ = 1h.46m.44s. Florence P = 1h. 45m.0s.

Jan. 8d. 10h. 12m. 53s. Epicentre $40^{\circ}0'N$, $47^{\circ}0'E$.

$A = +.523$, $B = +.560$, $C = -.613$; $D = +.731$, $E = -.682$;
 $G = +.439$, $H = +.470$, $K = -.766$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Helwan	16.3	236	7 7	?S	(7 7)	+ 5	—	—
Ekaterinburg	19.0	23	14 30	+ 1	18 4	+ 2	10.1	12.6
Vienna	23.3	301	5 19	- 1	—	—	—	14.4
De Bilt	30.9	308	—	—	—	—	e 16.1	—
Bidston	36.0	308	—	—	—	—	—	20.1
Edinburgh	36.1	313	18 7	?L	—	—	(18.1)	27.6

Additional records: De Bilt gives eLN = $+15.1m$. Eskdalemuir ($\Delta = 36^{\circ}1'$) records from 10h.30m. to 10h.50m.

Jan. 8d. 21h. 45m. 20s. Epicentre $11^{\circ}7'S$, $162^{\circ}5'E$. (as on 1919 Jan. 6d.).

$A = -.934$, $B = +.294$, $C = -.203$.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	24.4	e 6 10	+38	9 54	+ 2	e 11.9	13.7
Honolulu	50.9	—	—	—	—	25.8	30.2
Batavia	55.2	25 34	?L	—	—	(25.6)	25.8
La Paz	122.5	32 16	?SR ₁	—	—	—	—

Riverview gives MN = $+12.9m$. Malabar gives eP-iS = $17.5s$., so apparently this and Batavia give the record of an independent very local earthquake.

Jan. 8d. Records also at 1h. (Harvard records an explosion at Acton), 6h. (Honolulu and Riverview), 8h. (Helwan and La Paz), 12h. (La Paz), 14h. (Rocca di Papa).

Jan. 9d. Records at 0h. (La Paz and San Fernando), 10h. (La Paz), 11h. (Harvard), 19h. (Manila, La Paz, and Ekaterinburg), 22h. (Ekaterinburg).

Jan. 10d. Records at 1h. (San Fernando), 4h. La (Paz), 5h. (Helwan, Batavia, La Paz, Manila, and Riverview), 6h. and 8h. (Rocca di Papa), 10h. (La Paz), 16h. (Tokyo), 18h. (Melbourne and Riverview), 19h. (Helwan and San Fernando), 23h. (Nagasaki).

Jan. 11d. 9h. 35m. 10s. Epicentre $14^{\circ}5N$, $145^{\circ}5E$. (as on 1917 June 18d.).

$$A = -.798, B = +.548, C = +.250; \quad D = +.566, E = +.824; \\ G = -.206, H = +.142, K = -.968.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	23.8	274	e 5 34	+ 8	—	—	10.9	—
Taihoku	24.8	299	—	—	(10 26)	+27	10.4	—
Batavia	43.6	244	i 8 9	-14	—	—	—	—
Honolulu	53.9	75	—	—	—	—	25.7	35.0
Ekaterinburg	75.1	327	i 11 56	+ 6	23 37	?	35.8	47.2
De Bilt	105.1	336	—	—	—	—	e 59.8	70.0
La Paz	147.5	98	19 47	{ - 5 }	—	—	—	—

De Bilt gives eLN = +58.8m.

Jan. 11d. Records also at 0h. (San Fernando), 5h. (Helwan), 10h. and 13h. (Taihoku), 14h. (Riverview).

Jan. 12d. 13h. 21m. Epicentre close to Tokyo, which gives $P = +9s$, $S = +30s$.
 Kobe gives $PSN = +19s$, $PSN = +18s$, $LMEN = -59s$. Osaka
 $P = +22s$, $L = +56s$, $M = +1.5m$. Mizusawa $PE = +65s$, $PN = +66s$, $SEN = +2m.10s$.

Jan. 12d. 15h. 25m. 55s. Epicentre $22^{\circ}0S$, $170^{\circ}0E$. (as on 1917 Feb. 12d.).

$$A = -.913, B = +.161, E = -.375.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	20.4	230	e 4 41	- 5	e 8 32	0	10.6	12.7
Manila	60.4	303	e 10 29	+14	—	—	—	—
Ekaterinburg	118.8	324	—	—	—	—	57.1	—
De Bilt	147.7	343	—	—	—	—	e 73.1	80.3

Riverview gives also $iS = +8m.35s$, $PS = +8m.45s$, $MN = +13.1m$, $T_0 = 15h.25m.47s$.

Jan. 12d. Records also at 5h. (Helwan), 6h. (Riverview), 7h. (Taihoku), 11h. (Rocca di Papa, Taihoku, and Pompeii).

Jan. 13d. Records at 11h. (Ekaterinburg and De Bilt), 12h. (Manila), 14h. (La Paz), 17h. (Lick), 20h. (Jamaica), 21h. (San Fernando), 22h. (Taihoku).

Jan. 14d. Records at 15h. (Taihoku), 16h. (Kew), 19h. (San Fernando, Batavia, and Lick), 20h. (Taihoku), 21h. (Pompeii).

Jan. 15d. Records at 2h. (Chicago and Riverview), 10h. (Edinburgh), 12h. (Taihoku (2)), 14h. (San Fernando), 22h. (La Paz).

Jan. 16d. Records at 3h. (La Paz), 8h. (Rocca di Papa), 10h., 14h., and 15h. (La Paz).

1919. Jan. 17d. 11h. 49m. 50s. Epicentre 16° 0'N. 96° 0'W.

(as on 1917 Mar. 6d.).

A = -100, B = -956, C = +276; D = -995, E = +105;
G = -029, H = -274, K = -961.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Tucson	E.	21.0	323	4 38	-15	8 50	+ 6	10.6	12.0
	N.	21.0	323	4 27	-26	8 39	- 5	10.5	11.8
Chicago		26.7	14	5 51	- 4	10 35	0	e 14.8	—
	E.	28.2	33	e 3 51	?	11 17	+14	27.1	—
	N.	28.2	33	e 4 10	?	11 18	+15	28.1	—
Georgetown	Z.	28.2	33	e 3 56	?	—	—	28.4	—
		28.2	33	e 5 55	-15	11 17	+14	e 23.5	—
Washington	E.	28.2	33	11 19	?	(11 19)	+16	—	19.7
	N.	28.2	33	11 27	?	(11 27)	+24	—	19.7
Ann Arbor	E.	28.3	19	6 10?	- 1	10 34	-30	—	10.7
	N.	28.3	19	5 46	-25	10 40	-24	—	10.9
	E.	28.3	19	5 34	-37	10 40	-24	—	10.9
	N.	28.3	19	5 40	-31	10 40	-24	—	11.2
Toronto		31.0	24	—	—	—	—	19.9	27.0
		31.2	28	e 7 0	-20	11 46	- 8	e 20.2	—
Berkeley		31.8	318	—	—	e 11 31	-34	—	19.5
Ottawa		33.9	26	i 7 0	- 4	e 12 38	- 1	26.2	—
Harvard	E.	33.9	34	e 7 5	+ 1	12 52	+13	22.0	—
Victoria		39.4	331	19 17	?L	—	—	20.8	22.2
	Z.	39.4	331	19 10	?L	—	—	(19.2)	22.7
La Paz		42.6	138	(8 17)	+ 2	14 56	+13	24.3	26.8
Honolulu		58.7	286	—	—	—	—	e 27.7	31.2
Edinburgh		78.4	35	12 10	+ 1	—	—	—	52.2
Bidston		78.9	37	—	—	27 28	?SR ₁	—	44.4
De Bilt		84.0	37	—	—	23 32	+24	e 48.2	52.6
Helwan		111.6	48	32 10	?	—	—	—	—

Additional records: Chicago gives L = +18.2m. Ithaca SN = +11m.50s.
Berkeley MN = +19.8m. Ottawa e?N = +12m.15s., L = +33.2m. and
+44.2m., T₀ 11h.49m.44s. Harvard e? = 11h.51m.37s., eE = +8m.8s.,
SE? = +12m.39s., LN = +25.2m. La Paz gives P as PR₁ and T₀ =
11h.49m.23s. De Bilt MN = +61.1m. Helwan PN = +34m.10s.

Jan. 17d. Records also at 2h. (San Fernando), 8h. (La Paz), 13h. (Ekaterinburg),
18h. (La Paz), 19h. (Ekaterinburg), 20h. (La Paz), 21h. (San Fernando),
22h. (La Paz, Zi-ka-wei, and Manila), 23h. (De Bilt and Ekaterinburg).

Jan. 18d. 5h. 52m. 30s. Epicentre 3° 58. 102° 5'E. (as on 1916 April 15d.).

A = -216, B = +975, C = -061; D = +976, E = +216;
G = +013, H = -060, K = -998.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Batavia		5.1	123	e 0 19	-30	2 18	- 2	—	7.6
Colonbo		24.9	294	6 6	+29	(9 24)	-37	9.4	11.2
Manila		25.7	45	e 6 24	+39	11 21	+65	16.0	17.1
Kodaikanal		28.5	299	10 48	?S	(10 48)	-20	16.0	17.0
Perth		31.1	158	11 59	?S	(11 59)	+ 6	—	—
Taihoku		34.0	33	—	—	e 12 49	+ 9	19.8	21.5
Bombay		36.8	308	7 7	-21	—	—	—	20.6
Zi-ka-wei		39.1	26	e 7 51	+ 4	e 14 0	+ 7	—	24.9
Adelaide		45.9	138	18 27?	?SR ₁	24 55	?L	30.6	37.6?
Mauritius		46.5	245	12 42	?S	(12 42)	-173	—	16.7
Melbourne		51.8	137	17 24	?S	(17 24)	+43	36.3	49.0
Riverview		54.5	130	e 17 54	?S	(17 54)	+39	e 31.6	33.0
Sydney		54.5	130	28 42	?L	32 24	?	33.8	37.3
Ekaterinburg		69.1	337	i 11 12	0	i 20 3	-12	32.5	38.0
Helwan	E.	75.5	302	21 12	?S	(21 12)	-20	—	49.4
	N.	75.5	302	21 0	?S	(21 0)	-32	—	50.8
Rocca di Papa		92.2	312	—	—	(e 24 6)	-31	e 24.1	—
Hamburg		91.1	324	—	—	e 24 30	-30	e 53.5	62.5

Continued on next page.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
De Bilt	E.	97.3	322	—	—	24 37	-52	e 54.5	64.0
	N.	97.3	322	—	—	e 25 3	-26	e 49.5	59.2
Ucele		97.9	321	—	—	e 24 48	-47	—	59.5
Kew		100.7	322	—	—	—	—	—	67.5
Eskdalemuir		101.8	326	24 47	?x	(24 47)	-86	51.5	—
Bidston		102.1	321	25 54	?x	(25 54)	-22	—	57.0
Ottawa		138.0	2	—	—	—	—	e 79.5	—
Chicago		140.7	12	—	—	—	—	84.5	—
La Paz		158.0	24	20 43	[+37]	34 53	?	83.1	84.1

Additional records: Batavia gives P 10min. early, $T_0 = 5h.51m.30s.$ Manila MN = +19.6m., $T_0 = 5h.52m.53s.$ Zi-ka-wei MN = +26.9m., $T_0 = 5h.52m.35s.$ Adelaide SR₁ = +27m.30s. Riverview gives S as eP and S = -24m.6s., SR₁ = +27m.30s., MN = +33.3m. Ekaterinburg iSR₁ = +24m.26s., epicentre 1°0'S. 102°23'E.; this station gives all its observations one hour late. Hamburg MN = +58.5m. De Bilt eN = +39m.18s., $T_0 = 5h.52m.40s.$, epicentre 4°0'S. 99°3'E. (Sumatra). Eskdalemuir L = +68.5m. La Paz PR₁ = +24m.54s., $T_0 = 5h.53m.55s.?$

Jan. 18d. Records also at 1h. (Nagasaki), 5h. (La Paz), 9h. (Harvard), 13h. (Batavia), 14h. (Florence), 15h. (Taihoku), 21h. (Manila), 23h. (La Paz).

Jan. 19d. Records at 0h. (San Fernando), 4h. (La Paz), 11h. (Ekaterinburg and Rio Tinto), 12h. (Ekaterinburg and Manila), 15h. (La Paz), 17h. (Manila), 19h. (La Paz), 21h. (Taihoku), 23h. (Helwan, La Paz, and San Fernando).

Jan. 20d. Records at 2h. (Barcelona), 9h. (Lick and Berkeley), 13h. (Manila), De Bilt gives a series of ten e's at 13h., due to an explosion in Belgium.

Jan. 21d. Records at 1h. (San Fernando), 2h. (Manila, Monte Cassino, and Rocca di Papa), 7h. (Batavia, Riverview, and Manila), 8h. (Batavia and Monte Cassino), 9h. (Ekaterinburg), 10h. (Rocca di Papa, Paris, Edinburgh, De Bilt, Helwan, Pompeii, Bidston, and Vienna), 11h. (La Paz and Cape Town), 15h. (Mauritius), 20h. (San Fernando).

Jan. 22d. 3h. 24m. 20s. Epicentre 41°-0'N. 24°-6'E. (as on 1918 Mar. 31d.).

A = +.686, B = +.314, C = +.656.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	3.2	1 0	+10	e 1 32	+ 4	i 1.7	1.8
Pompeii	7.6	1 49	-6	3 23	- 3	5.7	—
Rocca di Papa	9.0	4 12	?S	(4 12)	+ 9	—	4.6

Zante ($\Delta = 5.7m.$) gives a record at 3h.24m.

Jan. 22d. Records also at 1h. and 4h. (Helwan), 9h. (La Paz), 13h. (Florence), 15h. (La Paz, Tokyo, and Mizusawa), 18h. (La Paz), 19h. (Tokyo, Mizusawa, and Zurich), 23h. (San Fernando and Manila).

Jan. 23d. Records at 4h. (Tokyo), 9h. and 10h. (Taihoku), 14h. and 15h. (La Paz), 21h. (San Fernando and Riverview), 23h. (La Paz).

Jan. 24d. 3h. 25m. 50s. Epicentre 36°-0'N. 139°-0'E. (as on 1918 May 7d.).

A = -.611, B = +.531, C = +.588.

Direct comparison with 1918 May 7d. suggests that the epicentre is very probably the same in both cases: but if Osaka and Kobe record P rather than S, as seems likely, the epicentre should be further east, say at 36°-0'N. 140°-4'E.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	0.8	0 12	0	0 20	- 2	—	—
Osaka	3.2	e 1 24	?S	(1 24)	- 4	2.2	2.6
Kobe	3.4	1 12	+19	—	—	2.2	3.5
Mizusawa	3.5	1 2	+7	—	—	1.8	—

Kobe gives its record at 13h. instead of 3h., MN = +3.4m.

Jan. 24d. Records also at 0h. (Helwan, La Paz, Riverview, and Apia), 2h. and 17h. (San Fernando), 18h. (Taihoku).

Jan. 25d. Records at 1h. (San Fernando and Helwan), 13h. (La Paz (2)), 15h., 18h., and 19h. (La Paz), 22h. (Lick), 23h. (San Fernando).

Jan. 26d. Records at 4h. and 5h. (La Paz), 6h. (Mizusawa), 11h. (Manila), 16h. (Paris), 23h. (La Paz).

Jan. 27d. 21h. 38m. 20s. Epicentre $50^{\circ}0'N$, $175^{\circ}0'W$.

$$\begin{aligned} A &= -0.640, B = -0.56, C = +0.364; & D &= -0.687, E = +0.996; \\ G &= -0.763, H = -0.667, K = -0.643. \end{aligned}$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Honolulu	31.6	147	—	—	—	—	e 14.7	15.1
Mizusawa E.	32.6	267	(6 33)	-20	—	—	—	—
Victoria	33.1	71	—	—	(12 27)	+ 1	12.4	19.9
Berkeley	39.0	87	—	—	e 14 40?	+48	—	—
Zi-ka-wei	50.1	273	e 9 2	- 6	e 16 1	-19	—	—
Chicago	57.8	61	10 8	+10	18 10	+14	28.2	—
Ann Arbor E.	59.6	58	—	—	—	—	33.7	—
Toronto	61.1	55	—	—	(17 46)	-51	e 40.7	19.8
Ottawa	61.7	51	—	—	e 25 10	?SR ₁	e 30.7	—
Manila	62.3	261	e 10 33	+ 6	(e 18 12)	-40.	—	—
Ekaterinburg	63.7	330	i 10 20	-16	i 18 52	-17	28.7	39.2
Georgetown	65.6	58	—	—	i 21 5	?	e 38.6	—
Edinburgh	73.9	4	33 20	?L	—	—	(33.3)	46.2
Eskdalemuir	74.4	4	21 19	?S	(21 19)	0	—	—
De Bilt	77.9	359	—	—	e 22 52	+53	37.7	46.9
Paris	81.1	1	—	—	—	—	e 49.7	—
Rocca di Papa	88.0	354	e 13 1	- 4	—	—	e 52.6	62.2
San Fernando	93.0	9	23 40	?S	(23 40)	-65	(52.7)	—
Colombo	94.2	285	60 40	?L	—	—	(60.7)	—
Helwan E.	96.8	337	26 22	?S	(26 22)	+58	—	—

Additional records: Mizusawa gives PE = +4m.34s. Zi-ka-wei T₀ = 21h.38m.34s. Chicago L = +33.7m. Ottawa L from 22h.11m. to 22h.25m. Manila gives its S as part of an independent shock. Ekaterinburg iPR₁ = +12m.39s., iPR₂ = +14m.20s. Georgetown eE = +20m.51s. De Bilt MN = +49.5m. Helwan PN = +25m.46s.

Jan. 27d. Records also at 0h. (Mizusawa and Athens), 2h. (San Fernando), 4h. (La Paz and Manila), 5h. (Manila), 6h. (La Paz), 10h. (Colombo), 14h. (Mizusawa), 16h. and 23h. (La Paz).

Jan. 28d. Records at 4h. (Helwan and San Fernando), 9h. (Batavia and La Paz), 13h. and 14h. (La Paz).

Jan. 29d. Records at 1h. (Mizusawa), 3h. (Honolulu), 6h. (La Paz), 9h. (Mizusawa), 18h. (Taihoku and Riverview).

Jan. 30d. Records at 1h., 4h., and 8h. (Helwan), 15h. (Manila), 21h. (Lick), 23h. (La Paz).

Jan. 31d. 23h. 43m. 15s. Epicentre $41^{\circ}0'N$, $127^{\circ}0'W$. (as on 1917 June 10).

$$\begin{aligned} A &= -0.453, B = -0.603, C = +0.656; & D &= -0.799, E = +0.602; \\ G &= -0.395, H = -0.524, K = -0.755. \end{aligned}$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Berkeley	4.8	130	e 1 12	- 2	—	—	—	6.8
Lick	5.7	132	—	—	e 1 55	-41	—	5.3
Victoria	7.8	17	2 11	+13	—	—	3.7	4.3
	7.8	17	1 57	- 1	—	—	3.3	4.1
Tucson Z.	15.5	119	—	—	—	—	8.7	10.8
E.	15.5	119	—	—	—	—	9.2	9.5
N.	15.5	119	—	—	—	—	—	—
Chicago	29.2	75	6 13	- 7	10 28	-52	14.8	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ann Arbor	E. 31.9	75	16 15?	?L	—	—	19.0	20.0
	N. 31.9	75	16 3?	?L	—	—	18.8	19.2
Honolulu	32.8	243	—	—	(e 12 27)	+ 6	e 12.4	19.2
Toronto	34.7	70	(5 33)	-98	(13 39)	+48	18.6	—
Ottawa	36.9	66	e 17 25	?L	—	—	18.2	—
Ithaca	37.1	72	—	—	—	—	e 19.5	—
Washington	37.7	77	—	—	e 16 15	?SR ₁	e 19.5	—
Georgetown	37.7	77	—	—	e 15 7	+93	e 20.2	—
Cheltenham	E. 38.8	77	—	—	—	—	19.1	23.8
	N. 38.8	77	—	—	—	—	19.5	22.9
Harvard	40.9	69	—	—	19 5	?L	20.6	23.3
Edinburgh	72.0	29	20 45	?S	(20 45)	- 5	—	43.2
Eskdalemuir	72.4	30	19 31	?S	(19 31)	-84	39.8	—
Kew	76.5	32	—	—	—	—	—	42.8
De Bilt	78.0	28	—	—	—	—	35.8	47.4
Uccle	78.7	29	—	—	—	—	—	41.8
Paris	79.7	31	—	—	—	—	e 38.8	47.8
Strasbourg	81.9	31	45 52	?L	—	—	(45.9)	—
Ekaterinburg	81.9	358	—	—	—	—	48.8	—
San Fernando	E. 85.4	45	40 45	?L	—	—	(40.8)	47.8
	N. 85.4	45	37 45	?L	—	—	(37.8)	53.8
Helwan	106.3	20	59 45	?L	—	—	(59.8)	—

Additional records: Berkeley gives MN = +4.7m., MV = +6.5m. Toronto gives all its records as Ls. Ottawa L = +31.8m. Georgetown LE = +22.5m., LN = +24.2m. Harvard T₀ = 23h.53m.34s. De Bilt MN = +38.3m. Helwan PN = +64m.45s.

Jan. 31d. Records also at 2h. (Riverview and San Fernando), 5h. (Helwan), 11h. (Tokyo and Mizusawa), 20h. and 21h. (Taihoku).

Feb. 1d. Records at 4h. and 5h. (Helwan), 6h. (Athens), 16h. (Tokyo), 18h. and 20h. (La Paz), 21h. (Rocca di Papa), 22h. (Mizusawa) and Ootomari (2).

1919. Feb. 2d. 20h. 2m. 50s. Epicentre 72° 0N. 2° 8W.

(as on 1917 Aug. 21d.).

A = +.309, B = -.015, C = +.951; D = -.049, E = -.999;
G = +.950, H = -.046, K = -.309.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Dyce	14.7	179	i 3 32	- 3	—	—	7.0	9.0
Edinburgh	16.1	184	4 40	-47	—	—	—	9.7
Eskdalemuir	16.7	184	3 57	- 4	i 7 11	0	—	—
Bidston	18.6	180	—	—	—	—	—	19.2
Hamburg	19.2	156	e 4 42	+11	i 8 16	+10	11.9	14.8
De Bilt	20.2	166	4 48	- 5	8 33	+ 6	9.5	15.5
Oxford	20.2	177	4 53	+10	8 30	+ 3	10.9	12.6
Kew	20.6	180	—	—	—	—	—	17.2
Shide	21.3	183	—	—	8 53	+ 3	11.5	13.6
Uccle	21.4	169	e 4 59	+ 1	8 55	+ 2	10.2	12.2
Paris	23.3	174	e 5 26	- 6	e 9 29	- 2	13.2	15.2
Strasbourg	23.9	163	5 25	- 2	9 46	+ 4	14.4	18.2
Besançon	25.1	166	5 34	- 5	10 14	+ 9	15.2	—
Zurich	25.2	162	e 5 41	+ 1	—	—	—	—
Vienna	25.3	149	e 5 43	+ 2	e 9 58	-11	15.3	17.0
Moncalieri	27.5	164	7 20	?	11 4	+14	13.7	19.2
Marseilles	29.0	168	e 6 41	+23	—	—	17.2	21.2
Ekaterinburg	29.4	87	i 6 25	+ 3	i 11 26	+ 2	16.2	—
Barcelona	30.6	173	—	—	—	—	15.0	21.2
Rocca di Papa	31.2	157	6 36	- 4	—	—	22.7	26.8
Tortosa	31.2	175	7 1	+21	11 15	-39	13.6	20.5
Coimbra	31.9	188	7 43	+57	11 57	-10	15.6	17.1
Algiers	35.3	170	—	—	e 12 38	-22	18.2	23.7
San Fernando	35.6	183	14 40?	PR ₁	—	—	18.2	21.2
Ottawa	42.2	272	—	—	e 14 22	-16	e 21.2	—
Northfield	42.4	268	—	—	—	—	e 23.2	—
Harvard	E. 43.5	266	e 3 33	?	e 15 6	+11	22.3	—
	N. 43.5	266	i 3 48	?	e 14 45	-10	—	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Toronto	44.9	274	—	—	21 34	?L	e 24.0	25.6
Ithaca	45.1	271	—	—	—	—	e 22.7	—
Helwan	45.9	138	12 10	?	—	—	—	—
Washington	48.5	270	—	—	e 15 43	-17	24.8	—
Georgetown	48.5	270	—	—	e 14 17	-103	e 22.6	—
Chicago	49.1	279	10 40	+99	15 55	-12	19.8	—
Victoria	52.7	314	21 37	?SR ₁	—	—	26.5	29.0
Colombo	81.2	95	52 10	?L	—	—	(52.2)	57.2
Manila	85.8	53	—	—	—	—	e 46.2	—
Capetown	107.0	162	60 58	?L	—	—	(61.0)	—

Additional records: Eskdalemuir gives $T_0 = 20\text{h.}2\text{m.}46\text{s.}$ Hamburg $i = -4\text{m.}49\text{s.}$, $MN = +16.1\text{m.}$, $T_0 = 20\text{h.}2\text{m.}21\text{s.}$ Epicentre $67^{\circ}0\text{N. } 18^{\circ}0\text{W.}$
 De Bilt $MN = +15.0\text{m.}$, $T_0 = 20\text{h.}2\text{m.}57\text{s.}$ Epicentre $70^{\circ}6\text{N. } 13^{\circ}1\text{W.}$
 Uccle $M = +17.2\text{m.}$, $T_0 = 20\text{h.}2\text{m.}54\text{s.}$ Paris $T_0 = 20\text{h.}3\text{m.}12\text{s.}$ Stras-
 bourg $T_0 = 20\text{h.}2\text{m.}47\text{s.}$ Vienna $MN = +18.2\text{m.}$ Moncalieri $MN =$
 -17.8m. Rocca di Papa $L = -23.2\text{m.}$ Coimbra $MN = +17.7\text{m.}$
 San Fernando $MN = -19.4\text{m.}$ Ottawa $L = -33.2\text{m.}$ Harvard $eE =$
 $-12\text{m.}31\text{s.}$, $LE = +22.7\text{m.}$ and -23.7m. Toronto $E = +17\text{m.}58\text{s.}$
 Helwan $PN = +10\text{m.}10\text{s.}$ Georgetown $LE = +26.3\text{m.}$, $LN = +27.1\text{m.}$
 Chicago $L = +24.2\text{m.}$ and $+26.2\text{m.}$

Feb. 2d. Records also at 2h. (Manila), 7h. (Manila, La Paz, and Capetown), 8h. and 9h. (Helwan), 17h. and 22h. (Manila).

Feb. 3d. 2h. 23m. 20s. Epicentre $52^{\circ}0\text{N. } 170^{\circ}0\text{E.}$ (as on 1917 Nov. 14d.).

$A = -.606$, $B = +.107$, $C = +.788$; $D = +.174$, $E = +.985$;
 $G = -.776$, $H = +.137$, $K = -.616$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E. 23.7	249	5 40	-15	9 43	-5	—	—
	N. 23.7	249	5 28	+3	9 29	-9	—	—
Tokyo	26.9	245	e 5 56	-1	—	—	—	—
Osaka	30.1	248	6 27	-2	—	—	—	9.0
Manila	53.9	243	e 10 20	+48	—	—	—	14.7
De Bilt	75.1	351	—	—	—	—	e 53.7	—
La Paz	122.4	78	19 25	[+26]	—	—	—	—

Osaka gives $MN = +8.6\text{m.}$

Feb. 3d. Records also at 1h. (Taihoku), 4h. (Helwan), 8h. (La Paz, Ootomari, and Helwan), 10h. (Ekaterinburg), 12h. (Monte Cassino), 14h. (Taihoku), 15h. (La Paz), 19h. (Ekaterinburg and Manila), 20h. (San Fernando), 23h. (Ekaterinburg (2)).

Feb. 4d. Records at 7h. (Mauritius), 11h. and 22h. (Athens).

Feb. 5d. 20h. 4m. 15s. Epicentre $34^{\circ}5\text{N. } 138^{\circ}0\text{E.}$ (as on 1916 Sept. 15d.).

$A = -.613$, $B = -.551$, $C = +.566$; $D = -.669$, $E = +.743$;
 $G = -.421$, $H = +.379$, $K = -.824$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	1.9	50	0 47	+18	1 27	+34	2.5	3.9
Osaka	2.2	274	0 48	+14	—	—	2.1	7.7
Kobe	2.4	275	—	—	1 5	-1	3.3	3.8
Mizusawa	E. 5.2	28	1 14	-6	2 47	-25	—	—
	N. 5.2	28	1 21	+1	2 50	+28	—	—
Zi-ka-wei	14.3	262	3 6	-24	—	—	—	—
Taihoku	17.1	241	2 45	-81	—	—	—	—
Manila	24.9	222	4 19	-78	—	—	11.9	12.0
Honolulu	57.1	85	17 45	?S	(17 45)	-2	25.3	34.3
Hamburg	81.2	332	—	—	—	—	e 45.8	52.8
Edinburgh	83.8	339	47 45	?L	—	—	(47.8)	—
De Bilt	84.1	333	—	—	—	—	e 45.8	50.8
Helwan	85.6	304	28 45	?SR ₁	—	—	35.8	—
Monte Cassino	88.4	322	—	—	—	—	79.6	—
Rocca di Papa	88.7	322	—	—	—	—	e 60.5	—
La Paz	150.8	60	19 21	[-36]	—	—	—	—

Additional records: Osaka gives $MN = +5.6\text{m.}$ Manila $MN = +12.1\text{m.}$
 De Bilt $MN = +52.0\text{m.}$ Helwan gives its two records as PN and PE respectively.

Feb. 5d. Records also at 1h. (Melbourne, Riverview, and Adelaide), 2h. (San Fernando and Jamaica), 3h. (Helwan), 10h. (La Paz), 15h. (Manila), 19h. (La Paz), 22h. (Jamaica).

Feb. 6d. Records at 0h. (Helwan), 2h. (La Paz), 4h. (San Fernando), 5h. (Monte Cassino), 7h. (Tokyo and Batavia), 8h. (Helwan), 11h. (Marseilles), 12h. (Helwan), 13h. (Strasbourg), 14h. (Rocca di Papa, De Bilt, Vienna, and Athens), 15h. (Athens), 22h. (San Fernando).

Feb. 7d. Records at 5h. (Taihoku), 23h. (San Fernando).

Feb. 8d. Records at 3h. and 10h. (Helwan), 13h. (La Paz), 14h. (Strasbourg (2)), 16h. (Mizusawa), 17h. (Tokyo), 18h. (La Paz, Tokyo, and Mizusawa), 19h. (Mizusawa (2) and De Bilt), 20h. and 22h. (Mizusawa), 23h. (Mizusawa and San Fernando).

Feb. 9d. 12h. 45m. 20s. (I) ; Epicentre $30^{\circ}6'N$, $144^{\circ}0'E$.
15h. 24m. 30s. (II) ;

As on 1913 April 7d. Compare also 1917 July 10d. 15h., where $30^{\circ}6'N$, $141^{\circ}8'E$. is adopted, but $31^{\circ}5'N$, $144^{\circ}0'E$. is suggested in the note at end.

$$A = -.696, B = +.596, C = +.509; \quad D = +.588, E = +.809; \\ G = -.412, H = +.299, K = -.861.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
I	Tokyo	6.2	330	3 2	28	(3 2)	+13	(5.0)	8.4
II		6.2	330	2 11	+36	3 42	21	(3.7)	5.1
I	Osaka	8.3	302	2 6	0	—	—	4.5	7.1
II		8.3	302	2 6	0	—	—	4.4	7.9
I	Mizusawa E.	8.8	345	2 32	+19	4 12	14	—	—
I	N.	8.8	345	2 30	+17	4 12	+14	—	—
II	E.	8.8	345	2 28	+15	3 57	-1	—	—
II	N.	8.8	345	2 38	+25	4 3	+5	—	—
II	Nagasaki	12.2	284	4 51	28	(4 51)	-33	6.1	—
I	Zi-ka-wei	19.4	278	e 4 28	-6	—	—	—	—
II		19.4	278	e 5 9	+35	—	—	—	—
I	Taihoku	20.6	260	e 4 50	+2	—	—	—	—
I	Manila	26.5	238	5 27	-26	—	—	11.4	11.7
II		26.5	238	e 6 1	+8	10 8	-24	11.6	12.1
I	Honolulu	52.4	85	18 4	?	—	—	30.2	34.7
II		52.4	85	19 6	?	—	—	31.5	36.0
I	Ekaterinburg	61.2	322	i 10 7	-13	i 18 33	-5	26.7	39.0
I	De Bilt	89.8	336	—	—	—	e 53.7	—	—
II		89.8	336	—	—	—	e 51.5	—	—
I	La Paz	147.5	72	19 59	[+ 7]	—	—	—	—

Additional records: Osaka I gives $MN = +6.3m$. and Osaka II $MN = +9.4m$.
Manila I $MN = +11.4m$. Manila II $MN = +11.8m$, $T_0 = 15h.25m.22s$.
De Bilt II eLN = +52.5m.

Feb. 9d. Records also at 1h. (Mizusawa), 2h. (Ekaterinburg), 5h. (Manila), 8h. (San Fernando), 13h. (Mizusawa and Helwan), 14h. (Zi-ka-wei and Kobe), 15h. (Taihoku and Ekaterinburg), 16h. (Mizusawa and Kobe), 18h. (La Paz).

Feb. 10d. Records at 0h. (La Paz), 10h. (La Paz and Balboa Heights), 15h. (La Paz), 17h. (Mizusawa), 18h. (San Fernando), 19h. (Zi-ka-wei), 21h. (Monte Cassino).

Feb. 11d. Records at 4h. (Lick), 5h. (La Paz), 13h. (Jamaica), 14h. and 17h. (La Paz), 21h. (Rocca di Papa).

1919. Feb. 12d. 12h. 41m. 55s. Epicentre 46°-0N. 149°-0E.

(as on 1917 April 28d.).

A = -596, B = +358, C = +719; D = +515, E = +857;
G = -617, H = +370, K = -695.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari		4.4	281	1 50	+42	—	—	3.2	3.8
Mizusawa	E.	8.9	223	2 18	+3	3 57	-4	—	—
	N.	8.9	223	2 31	+16	4 9	+8	—	—
Tokyo		12.4	218	—	—	—	—	e 6.0	—
Osaka		15.3	227	3 41	-2	—	—	8.1	14.0
Kobe		15.4	228	3 52	+8	—	—	8.0	11.0
Nagasaki		19.8	235	e 4 47	+8	—	—	—	—
Zi-ka-wei		25.9	245	e 5 41	-6	e 10 35	+15	—	17.7
Taihoku		30.3	235	—	—	e 12 34	+55	—	19.8
Manila		39.2	226	e 7 48	0	—	—	24.4	25.1
Honolulu		49.3	102	15 59	?S	(15 59)	-11	23.1	29.3
Ekaterinburg		52.2	317	i 9 5	-16	17 2	+16	27.1	33.2
Victoria		56.2	53	17 37	?S	(17 37)	+1	—	46.6
Bombay		67.0	275	34 1	?L	—	—	(34.0)	42.5
Kodaikanal		69.9	266	44 29	?L	—	—	(44.5)	—
Colombo		70.6	261	43 5	?L	—	—	(43.1)	53.8
Hamburg		74.5	337	11 41	-5	—	—	e 37.1	45.2
Edinburgh		75.5	345	21 25	?S	(21 25)	-7	—	49.1
Eskdalemuir		76.0	345	21 36	?S	(21 36)	-1	43.1	—
De Bilt		77.2	335	11 57	-5	—	—	44.1	—
Vienna		77.2	330	11 53	-9	—	—	—	—
Bidston		77.8	344	22 5	?S	(22 5)	+7	(34.1)	48.1
Uccle		78.5	335	11 59	-11	—	—	e 44.1	—
Kew		79.0	342	—	—	—	—	—	48.1
Strasbourg		79.7	336	12 8	-9	—	—	—	—
Riverview		79.8	178	e 21 53	?S	(e 21 53)	-28	e 39.5	47.7
Toronto		80.6	33	—	—	—	—	43.0	53.6
Paris		80.8	335	—	—	—	—	46.1	—
Florence		82.8	330	37 5?	?L	—	—	(37.1?)	—
Moncalieri		82.9	333	12 30	-5	22 59	+3	38.5	49.1
Rocca di Papa		84.1	327	12 32	-11	23 0	-9	e 48.5	57.9
Harvard		84.8	29	—	—	—	—	43.9	—
Helwan	N.	85.6	310	13 5	+14	—	—	—	—
Barcelona		87.7	336	—	—	i 23 39	-10	e 44.3	52.4
Coimbra		91.6	344	—	—	e 48 28	?L	57.4	—
Algiers		91.8	332	—	—	—	—	e 59.1	60.1
Rio Tinto		93.4	341	49 5	?L	—	—	(49.1)	62.1
San Fernando		94.6	340	50 35	?L	—	—	(50.6)	55.1
La Paz		137.3	53	—	—	—	—	e 78.1	—

Additional records: Osaka gives MN = +11.5m. Zi-ka-wei MN = +16.0m.,
T₀ = 12h.41m.25s. Manila MN = +26.5m. Ekaterinburg i₁ =
+10m.12s., i₂ = +14m.6s., SR₁ = +20m.32s., SR₂ = +22m.39s., MN =
+24.5m. Epicentre 50°56'N. 169°36'E. Hamburg MN = +41.1m.
Eskdalemuir eN = +27m.4s., eE = +34m.53s. De Bilt eLN = +45.1m.
Riverview eS = +28m.34s., MN = +52.0m. Moncalieri MN = +51.3m.,
T₀ = 2h.41m.54s. Rocca di Papa eL = +52.5m. Harvard LN =
+50.4m., L = +45.4m. Helwan PE = +15m.5s. Coimbra eN =
+54m.58s. San Fernando MN = +62.1m.

Feb. 12d. 20h. 17m. 30s. Epicentre 46°-0N. 149°-0E. (as at 12h.).

A = -596, B = +358, C = +719; D = +515, E = +857;
G = -617, H = +370, K = -695.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	8.9	223	2 16	+1	3 44	-17	—	—
	N.	8.9	223	2 36	+21	3 58	-3	—	—
Tokyo		12.4	218	—	—	e 5 33	+4	—	—
Osaka		15.3	227	3 51	+8	—	—	8.0	13.8
Kobe		15.4	228	3 47	+3	—	—	8.2	12.0
Zi-ka-wei		25.9	245	5 38	-9	e 10 30	+10	—	—
Taihoku		30.3	235	—	—	e 13 8	?SR ₁	—	19.5
Manila		39.2	226	e 8 26	+38	—	—	23.6	—
Honolulu		49.3	102	16 12	?S	(16 12)	+2	e 23.5	30.5
Ekaterinburg		52.2	317	i 9 2	-19	17 2	+16	25.5	29.2

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Colombo	70.6	261	49 30	?L	—	—	(49.5)	51.5
Hamburg	74.5	337	—	—	—	—	e 36.5	41.5
Edinburgh	75.5	345	42 30	?L	—	—	(42.5)	49.0
Eskdalemuir	76.0	345	—	—	—	—	—	41.5
De Bilt	E. 77.2	335	—	—	21 58	+ 7	e 36.5	41.3
	N. 77.2	335	—	—	—	—	e 42.5	49.4
Vienna	77.2	330	e 11 49	-13	e 22 48	+57	e 51.2	—
Uccle	78.5	335	e 11 55	-15	—	—	e 44.5	—
Strasbourg	79.7	336	12 5	-12	—	—	—	—
Riverview	79.8	178	e 33 48	?L	—	—	e 45.9	47.6
Moncalieri	82.9	333	—	—	21 26	-90	40.6	49.0
Rocca di Papa	84.1	327	12 26	-17	—	—	e 49.0	55.0
Helwan	85.6	310	22 30	?S	(22 30)	-56	—	—
Coimbra	91.6	344	—	—	—	—	e 57.5	—
San Fernando	94.6	340	54 30	?L	—	—	(54.5)	56.5
La Paz	137.3	53	19 45	[+10]	—	—	—	—

Additional records: Osaka gives MN = -11.3m. Ekaterinburg i = +10m.8s., sR₁ = +20m.24s., MN = +29.1m. Epicentre 50 33'N. 169.56'E.
Hamburg MN = +43.5m. De Bilt eSR₁N = +27m.25s. Vienna gives S ten minutes wrong. Riverview e? = -39m.30s., MN = +48.0m.
Rocca di Papa L = +55.0m.

Feb. 12d. Records also at 2h. (Tokyo), 4h. (Rocca di Papa), 6h. (Manila), 7h. (Rocca di Papa), 10h. (Ekaterinburg), 12h. (Mizusawa), 17h. (Manila), 20h. (Rocca di Papa).

Feb. 13d. Records at 2h. (Rocca di Papa and Pomueii), 3h. (San Fernando), 4h. (Helwan), 8h. (La Paz), 12h. (Mizusawa), 17h. (La Paz), 18h. (Helwan), 21h. (Barcelona), 23h. (Manila).

Feb. 14d. 15h. 9m. 20s. Epicentre 47°·5N. 129°·0E. (as on 1918 Jan. 30d.).

A = -·425, B = +·525, C = -·737; D = +·777, E = +·629;
G = -·464, H = +·573, K = -·676.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Zi-ka-wei	17.3	202	—	—	—	—	e 7.8	—
Taihoku	23.5	197	—	—	—	—	10.6	15.6
Manila	33.6	194	—	—	—	—	(17.7)	—
Ekaterinburg	41.1	309	—	—	e 14 23	+ 1	20.7	28.3
Edinburgh	69.1	333	36 20	?L	—	—	(36.3)	—
De Bilt	69.5	327	—	—	—	—	e 36.7	38.0
Eskdalemuir	69.6	333	—	—	—	—	37.7	—
Helwan	73.3	296	45 40	?L	—	—	(45.7)	—

Additional records: De Bilt gives MN = +45.2m. Helwan P'N = -49m.40s.
Manila gives its record at 7m. This has been corrected to 27m.

Feb. 14d. Records also at 8h. (Ekaterinburg), 10h. (La Paz), 13h. (San Fernando), 14h. (Osaka and Kobe), 18h. (Monte Cassino and Rocca di Papa), 22h. (Tokyo), 23h. (Helwan).

Feb. 15d. 2h. 17m. 17s. Epicentre 68°·2N. 13°·0W.

A = +·362, B = -·084, C = +·929; D = -·225, E = -·974;
G = +·905, H = -·209, K = -·371.

The observations were compared with the epicentre adopted on 1917 July 9, and possibly on 1917 Nov. 7, viz., 64°·0N. 20°·0W.; but it was clear that the change would be in the wrong direction. A better solution would perhaps be T₀ = 2h.17m.3s., 70°·0N., 11°·0W.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Dyce	12.0	151	—	—	—	—	6.7	11.7
Edinburgh	13.1	155	5 43	?S	(5 43)	- 3	—	9.0
Eskdalemuir	13.7	156	—	—	—	—	7.2	—
Bidston	15.5	158	6 43	?S	(6 43)	- 1	—	12.7
Oxford	17.4	155	—	—	—	—	8.1	10.9
Kew	17.9	153	—	—	—	—	—	10.7

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Hamburg		18.2	132	e 4 43	+24	—	—	—	—
Shide		18.4	156	—	—	—	—	11.2	13.5
De Bilt	E.	18.3	142	—	—	8 2	+15	10.8	14.8
	N.	18.3	142	4 31	+10	—	—	9.2	10.1
Uccle		19.3	145	e 4 31	-2	e 8 13	+5	e 12.7	—
Strasbourg		22.2	142	4 58	-9	—	—	—	—
Moncalieri		25.6	145	—	—	e 10 28	+14	15.4	19.6
Barcelona		28.0	155	—	—	e 10 55	-4	e 15.7	20.0
Coimbra		28.1	173	e 3 13	?	—	—	14.6	17.9
Rio Tinto		30.6	171	18 43	?L	—	—	(18.7)	22.7
San Fernando		32.0	170	16 43	?L	—	—	(16.7)	20.7
Ekaterinburg		33.5	72	—	—	—	—	8.7	15.6
Ottawa		38.6	267	—	—	e 13 43	-3	e 20.7	—
Harvard	N.	39.6	260	—	—	e 14 5	+5	20.5	—
	E.	39.6	260	—	—	e 14 12	+12	20.8	—
Ithaca		41.5	265	—	—	—	—	e 24.2	—
Toronto		41.5	269	—	—	—	—	e 22.0	25.1
Chicago		46.2	275	13 43	?	19 28	?SR ₁	22.7	—
Helwan		46.2	123	15 43	?S	(15 43)	+12	(32.7)	—

Additional records: Hamburg gives other records at +12m.43s. and
+16m.43s. De Bilt T₀=2h.17m.25s. Uccle T₀=2h.17m.12s. San
Fernando MN = +18.7m. Ottawa e = +17m.19s., L = +27.7m. Har-
vard eE = +17m.42s., LE = +23.1m., LN = +25.5m. Chicago L =
+25.7m. Helwan gives its two records as PE and PN respectively.

Feb. 15d. Records also at 0h. (Manila), 2h. (Rocca di Papa), 10h. (Manila), 17h. (Ekaterinburg).

Feb. 16d. 15h. 57m. 53s. Epicentre 37°-7'N. 118°-5'W.

A = -378, B = -695, C = +612; D = -879, E = +477;
G = -292, H = -537, K = -791.

Neither the epicentre 41°-0'N. 127°-0'W. of 1917 June 10, nor 36°-8'N. 114°-3'W. of 1918 May 6 will fit the records.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Lick	N.	2.5	262	i 0 45	+6	i 1 20	+11	e 1.7	1.9
Berkeley	N.	3.0	273	e 0 48	+1	—	—	—	2.3
	E.	3.0	273	e 0 49	+2	—	—	—	2.5
Tucson	E.	8.3	129	3 46	?S	(3 46)	+1	—	4.2
Victoria		11.2	343	7 45	?L	—	—	9.2	11.2
Chicago		24.0	71	8 12	?	13 7	?L	20.1	—
Toronto		30.0	67	—	—	—	—	9.1	—
Georgetown	E.	32.3	75	e 17 35	?L	—	—	20.6	—
Washington		32.3	75	—	—	—	—	e 16.9	—
Ottawa		32.5	62	—	—	—	—	e 18.4	—
Harvard		36.1	68	i 22 28	?L	—	—	22.7	22.8
De Bilt	E.	77.7	31	—	—	—	—	e 44.1	—

Additional records: Tucson gives PN = +3m.37s. Ottawa i = +18m.46s.
De Bilt eLN = +43.1m.

Feb. 16d. Records also at 6h. and 20h. (La Paz).

Feb. 17d. 17h. 57m. 20s. Epicentre 3°-0'S. 128°-0'E.

A = -615, B = +787, C = -052; D = +788, E = +616;
G = +032, H = -041, K = -999.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila		18.9	339	e 3 57	-31	7 22	-38	8.8	9.9
Batavia		21.3	260	4 56	-1	8 49	-1	—	9.0
Riverview		37.7	146	e 7 40	+4	13 29	-5	e 21.8	26.9
Melbourne		38.1	159	—	—	13 40	+1	22.4	22.7
Colombo		49.1	281	14 40	?S	(14 40)	-87	—	34.7
Kodaikanal		52.1	281	33 10	?L	—	—	(33.2)	—
Ekaterinburg		80.4	330	i 11 57	-24	i 22 34	+6	34.7	—
Helwan		97.3	300	24 40	?S	(24 40)	-49	—	—
De Bilt		112.0	324	—	—	—	—	e 56.7	—
Edinburgh		114.3	331	67 40	?L	—	—	(67.7)	—
La Paz		154.8	141	20 58	[+56]	—	—	—	—

Additional records: Manila gives MN = +9.2m., T₀ = 17h.57m.2s. Batavia
iP = -5m.1s., T₀ = 17h.57m.25s. Riverview MN = +27.2m., T₀ =
17h.57m.40s. Helwan PN = +27m.40s. De Bilt T₀ = 17h 57m.17s.,
1°-0'S. 127°-4'E.

Feb. 17d. Records also at 3h. (Manila), 4h. (Strasbourg and Riverview), 6h. (Riverview), 8h. (Ekaterinburg), 13h. (Port au Prince), 14h. (Ekaterinburg), 15h. (La Paz), 19h. (Batavia), 21h. (Edinburgh).

Feb. 18d. 3h. 44m. 15s. Epicentre $37^{\circ}2'N$ $139^{\circ}0'E$.

$$A = -.601, B = +.522, C = +.605.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	1.7	0 21	- 5	0 45	- 3	—	—
Mizusawa	2.5	0 40	+ 1	1 17	- 8	—	—
Osaka	3.9	—	—	1 52	+ 5	3.0	4.3
Ekaterinburg	53.5	—	—	—	—	33.8	—

Mizusawa gives $PN = +41s$.

Feb. 18d. Records also at 6h. (Taihoku), 7h. (La Paz (2)), 8h. (La Paz), 16h. (Kodaikanal and Florence), 17h. (Batavia).

Feb. 19d. Records at 0h. (Mizusawa and Tokyo), 3h. (Riverview), 4h. (Berkeley), 12h. (Jamaica), 22h. (La Paz), 23h. (Helwan).

Feb. 20d. 12h. 32m. 55s. Epicentre $27^{\circ}0'S$ $72^{\circ}0'W$. (as on 1913 May 24d.).

$$A = +.275, B = -.847, C = -.454; \quad D = -.951, E = -.309;$$

$$G = -.140, H = +.432, K = -.891.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Andalgala E.	5.1	99	1 29	+10	—	—	3.3	3.7
N.	5.1	99	2 29	?S	(2 29)	+ 9	3.3	3.5
Mendoza	6.7	153	1 11	- 1	—	—	—	3.1
Pilar N.	8.5	126	2 17	+ 8	—	—	3.9	1.9
La Paz	11.1	19	2 41	- 5	4 55	- 2	5.7	6.6
Cipolletti	12.4	166	—	—	—	—	7.9	8.6
Helwan	113.8	67	64 5	?L	—	—	(64.1)	—

Helwan gives $PN = +61m.5s$. Mendoza, the records have been diminished by 6 min. Pilar, the records have been diminished by 3m.30s.

Feb. 20d. Records also at 14h. (La Paz), 15h. (Manila).

Feb. 21d. Records at 1h. (La Paz), 4h. (Eskdalemuir), 8h. (La Paz), 12h. (Zurich), 19h. (Mizusawa).

Feb. 22d. 4h. 16m. 41s. Epicentre $46^{\circ}5'N$ $151^{\circ}4'E$. (as on 1918 Nov. 22d.).

$$A = -.604, B = +.330, C = +.725; \quad D = +.479, E = +.878;$$

$$G = -.637, H = +.347, K = -.688.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Ootomari	5.9	285	1 49	+18	—	—	3.9	4.4
Mizusawa E.	10.5	229	2 37	0	4 38	- 5	—	—
N.	10.5	229	2 49	+12	4 37	- 6	—	—
Osaka	16.8	231	4 11	+ 9	—	—	—	13.9
Zi-ka-wei	27.6	247	c 5 59	- 5	e 10 47	- 5	—	—
Taihoku	32.0	258	—	—	e 12 12	+ 4	—	21.1
Manila	40.8	229	c 7 48	-13	12 43	-95	13.7	16.4
Honolulu	47.9	104	16 1	?S	(16 1)	+ 8	23.1	30.3
Victoria	54.6	54	34 36	?L	—	—	(34.6)	40.0
Kodaikanal	71.6	265	48 13	?L	—	—	(48.2)	—
Colombo	72.3	261	48 19	?L	—	—	(48.3)	57.3
Hamburg	74.7	339	11 19	-28	—	—	e 40.3	46.3
Edinburgh	75.4	346	19 19	?S	(19 19)	-131	—	50.8
De Bilt	77.3	340	—	—	e 21 43	- 9	e 41.3	45.3
Chicago	77.3	41	—	—	21 27	-25	28.3	—
Bidston	77.7	345	29 1	?SL ₁	44 55	?L	(44.9)	73.3

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Uccle	78.9	340	e 11 55	-17	—	—	—	48.3
Ottawa	79.2	32	e 43 19	?L	—	—	e 49.3	—
Toronto	79.3	35	—	—	—	—	—	42.2
Paris	80.9	340	—	—	—	—	e 45.3	54.3
Moncalieri	83.1	335	—	—	22 48	-10	41.5	48.7
Harvard	83.5	30	—	—	e 43 22	?L	47.7	56.1
Rocca di Papa	84.4	330	12 32	-12	—	—	—	13.8
Helwan	86.4	311	23 19	?S	(23 19)	-15	—	—

Additional records : Osaka gives MN = +12.5m. Zi-ka-wei T_0 = 4h.16m.37s.
 Manila MN = +14.4m., T_0 = 4h.18m.17s. Hamburg MN = +43.3m. De
 Bilt MN = +52.5m. Ottawa L = +54.3m. Toronto L = +53.5m.
 Moncalieri MN = +54.9m. Harvard LE = +51.5m. Helwan PN =
 +25m.19s.

Feb. 22d. Records also at 2h. (Mizusawa, Osaka, and Tokyo), 4h. (Manila), 5h. (Mizusawa), 11h. (Mizusawa, Osaka, Tokyo, Manila, and Ekaterinburg), 17h. (Manila and Ekaterinburg).

Feb. 23d. Records at 0h. (Zurich), 3h. (Helwan and Ekaterinburg), 5h. (Manila), 6h. (Riverview and Ekaterinburg), 9h. (La Paz), 10h. (Tokyo and Helwan), 11h. (San Fernando), 12h. (La Paz and Tokyo).

1919. Feb. 24d. 1h. 56m. 0s. Epicentre $36^\circ 7'N$. $21^\circ 0'E$.

A = +.749, B = +.287, C = +.598 ; D = +.358, E = -.934 ;

G = +.558, H = +.214, K = -.802.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2.5	60	0 42	+ 3	(1 9)	0	1.2	1.8
Pompeii	6.4	310	1 36	- 2	2 24	-31	4.0	4.6
Monte Cassino	7.3	313	1 47	- 4	—	—	—	5.3
Rocca di Papa	8.1	311	2 3	0	4 21	+41	e 8.3	5.5
	8.1	311	2 3	0	e 4 5	+25	e 5.0	7.3
Pola	9.7	329	e 2 21	- 5	—	—	e 6.0	6.9
Florence	10.2	317	4 47	?S	(4 47)	+12	—	7.0
Helwan	11.0	125	3 36	+52	—	—	—	14.2
Vienna	12.0	345	i 2 37	-22	e 7 0	?	e 16.0	—
Milan	12.4	318	4 31	+86	—	—	7.1	10.1
Moncalieri	13.0	314	3 12	- 1	5 33	-11	7.1	11.6
Lemberg	13.3	7	e 3 18	+ 1	e 5 30	-21	e 7.0	7.9
Marseilles	13.6	304	—	—	e 6 37	+39	9.0	—
Zurich	14.0	324	e 3 27	+ 1	e 6 22	+14	e 8.3	—
Algiers	14.3	276	e 3 24	- 6	6 20	+ 5	9.3	13.3
Barcelona	15.3	294	—	—	(6 44)	+ 5	e 6.7	12.0
Besancon	15.3	318	4 20	+37	—	—	10.0	—
Strasbourg	15.3	325	e 3 40	- 3	6 40	+ 1	9.2	9.8
Tortosa	16.4	291	3 55	- 2	7 10	+ 6	8.0	14.7
Paris	18.1	318	i 4 16	- 2	e 7 32	-10	11.0	14.0
Uccle	18.4	325	e 4 16	- 6	e 7 42	- 7	e 10.6	11.4
Hamburg	18.5	339	4 22	- 1	7 48	- 3	10.4	11.1
De Bilt	19.0	329	4 28	- 1	8 0	- 2	10.4	12.0
Granada	19.6	279	4 30	- 6	7 14	-61	—	—
Kew	21.1	321	—	—	—	—	—	12.0
Shide	21.2	319	—	—	8 38	-10	12.0	14.4
Bidston	23.6	323	9 0	?S	(9 0)	-36	—	14.0
Eskdalemuir	24.8	326	—	—	i 9 48	-11	e 13.4	14.8
Edinburgh	25.2	327	9 0	?S	(9 0)	-67	—	15.0
Dyce	E. 25.7	330	—	—	10 36	+20	15.7	—
	N. 25.7	330	—	—	i 10 18	+ 2	15.6	22.7
Ekaterinburg	33.1	40	6 54	- 3	11 36	-50	16.0	20.1
Capetown	70.7	182	36 54	?L	39 24	?	(36.9)	45.2
La Paz	99.1	256	58 11	?L	—	—	(58.2)	—

Additional records : Athens gives MN = +1.4m. Pola MN = +7.1m.
 All these records are given one hour late, Central European time. Helwan
 MN = +13.2m. Moncalieri MN = +9.8m., T_0 = 1h.56m.19s. Algiers
 T_0 = 1h.55m.47s. Paris T_0 = 1h.56m.13s. Uccle T_0 = 1h.56m.0s.
 Hamburg MN = +11.3m., T_0 = 1h.56m.6s. De Bilt T_0 = 1h.56m.4s.
 Zante (Δ = 2.1) gives a record 1h.55m.

Feb. 24d. Records also at 8h. (San Fernando), 9h. (Athens), 21h. (Manila).

Feb. 25d. 22h. 38m. Slight shock recorded near Berkeley and Lick. Probably not from the same origin as that on Feb. 16d., as the Lick records are so much later than those of Berkeley. Berkeley $iP = +52s.$, $iL = +60s.$, $MEN = +62s.$, and $MZ = +66s.$ Lick $ePEN = +67s.$, $iLN = +81s.$, $eLE = +83s.$, $MN = +83s.$, $ME = +88s.$ La Paz $P = +45m.57s.$

Feb. 25d. Records also at 0h. (San Fernando and Riverview), 1h. (Tokyo and Mizusawa), 8h. (La Paz and Taihoku), 9h. (Athens), 11h. (Helwan), 12h. (Apia), 13h. (Ekaterinburg and Taihoku (2)), 15h. (Helwan and La Paz), 16h. (La Paz), 19h. (San Fernando and Taihoku), 21h. (Rocca di Papa).

Feb. 26d. Records at 9h. (Manila and Ekaterinburg), 10h. (Helwan and Batavia), 23h. (San Fernando).

Feb. 27d. Records at 8h. (Ekaterinburg and Helwan), 9h. (Hamburg), 14h. (Ekaterinburg and Helwan), 22h. (San Fernando).

Feb. 28d. Records at 8h. (Manila), 10h. and 11h. (Ekaterinburg), 13h. (Jamaica), 23h. (La Paz).

Mar. 1d. There are great difficulties in reconciling the records. We have only three records of S and P, viz:—

	P.			S-P.		Δ	T ₀	
	h.	m.	s.	m.	s.	°	h.	m. s.
Tokyo	13	39	14	2	47	14.5	13	35 41
Manila	13	40	21	4	12	23.5	34	58
Ekaterinburg	13	47	40	9	28	73.3	36	2

If Manila is 1 minute in error we get fair accordance at 13h.35m.54s. Ekaterinburg gives for the epicentre $13^{\circ}17'N.$ $141^{\circ}24'E.$ On 1917 Nov. 24 an epicentre near that place was adopted, viz., $13^{\circ}5'N.$ $143^{\circ}0'E.$, but the residuals for Riverview are $-25s.$ in P and $-44s.$ in S, shewing that the epicentre should be $3^{\circ}5'$ nearer. An unfortunate slip in computation for Melbourne obscures its evidence: Δ should be $51^{\circ}3'$ instead of $22^{\circ}5'$, and then the P observation $+16m.14s.$ when treated as S gives a residual $-21s.$, or $1^{\circ}9'$ nearer. The Azimuth should moreover be 178° instead of 353° . A re-examination of the adopted $T_0 = \text{Nov. 24d.11h.10m.52s.}$, shews that any reasonable alteration of it would emphasise these negative differences. We have 5 determinations in all, and the corrections to T_0 indicated are Manila $+30s.$, Mizusawa $-23s.$, Zi-ka-wei $-2s.$, Riverview $-1s.$, Honolulu $+3s.$; mean $+11s.$; and by laying stress on the stations nearer the epicentre, a case could be made out for increasing T_0 still further. The evidence suggests a deep focus; and the single antipodal residual for La Paz; [$-7s.$], which becomes [$-18s.$] if we adopt the mean Correction to T_0 , supports this view. If we adopt then a correction of $+11s.$ to T_0 and a focal depth of 0.020 , the computation would stand as follows for the stations concerned:—

	Δ	Corrn. focus.	P.	O-C.	S.	O-C.
			m. s.	s.	m. s.	s.
Manila	21.4	-0.9	e 4 53	+ 5	8 29	- 5
Osaka	22.3	-1.0	5 3	8	—	—
Mizusawa	25.7	-1.1	5 27	- 7	9 34	-21
Zi-ka-wei	26.6	-1.2	e 5 40	- 2	e 10 18	+ 7
Batavia	41.0	-1.7	e 7 40	- 9	—	—
Riverview	47.9	-2.0	i 8 17	-22	e 14 58	-29
Sydney	47.9	-2.0	13 57	?S	(13 57)	-90
Melbourne	51.3	-2.1	16 3	?S	(16 3)	- 6
Honolulu	56.5	-2.3	e 9 45	+11	17 39	+28
Colombo	62.4	-2.4	19 57	?S	(19 57)	+94

—and these results may be considered a good approximation. This case has been re-examined thus because, though there seems to be similar evidence of deep focus on 1919 Mar. 1, we have then no record from an antipodal station. But with this support from 1917 Nov. 24 we may adventure the hypothesis of a focus below normal. Trial of the actual epicentre and depth of 1917 Nov. 24d. shewed systematic differences suggesting ultimately a greater depth 0.030 , and the epicentre $9^{\circ}0'N.$ $141^{\circ}0'E.$ Thus—

1919. Mar. 1d. 13h. 36m. 0s. Epicentre 9°·0N. 141°·0E.

A = -·768, B = +·622, C = +·156; D = +·629, E = +·777;

G = -·121, H = +·098, K = -·988.

A focal depth 0·030 below normal has been assumed.

	Focus Corrn.	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	-1·2	20·4	288	e 4 21	-10	8 33	+27	10·5	10·8
Taihoku	-1·6	24·5	313	e 5 16	0	—	—	—	11·7
Osaka	-1·7	26·2	350	5 31	2	—	—	—	15·3
Tokyo	1·7	26·7	357	(6 1)	-23	6 1	? 1'	9·4	—
Zi-ka-wei	-1·9	28·8	323	e 5 36	-21	—	—	—	—
Batavia	-2·4	37·3	247	e 6 27	-45	—	—	—	13·0
Riverview	-2·7	43·9	168	—	—	e 14 30	+ 6	e 25·6	27·0
Sydney	-2·7	43·9	168	9 18	-73	—	—	25·6	26·8
Honolulu	-3·6	59·8	70	—	—	—	—	33·0	37·5
Colombo	-3·7	60·5	274	28 0	? 1.	—	—	(28·0)	—
Ekaterinburg	-3·9	77·3	328	e 11 40	- 2	21 8	+ 1	30·0	44·7
Helwan	-4·4	102·2	304	—	—	22 0	?	—	—
Hamburg	-4·5	105·1	332	—	—	—	—	e 60·0	65·0
Edinburgh	-4·6	107·9	340	56 0	? 1.	—	—	(56·0)	61·0
De Bilt	-4·6	108·2	333	—	—	25 12	-77	53·0	69·2
Eskdalemuir	-4·6	109·2	340	—	—	—	—	58·0	—
Strasbourg	-4·6	109·4	330	—	—	—	—	59·2	—
Uccle	-4·6	109·5	333	—	—	—	—	e 59·0	67·0
Bidston	-4·6	110·6	338	34 24	? SR ₁	46 0	? 1.	(46·0)	64·0
Rocca di Papa	-4·6	110·7	321	40 20	?	—	—	e 63·0	76·1
Kew	-4·6	111·0	337	—	—	—	—	—	69·5
Moncalieri	-4·6	111·7	326	25 49	? S	(25 49)	-73	51·0	66·6
Paris	-4·6	111·8	333	—	—	e 58 0	? 1.	65·0	72·0
San Fernando L.	—	125·1	326	65 12	? L	—	—	72·5	75·0

Additional records: Manila gives MN = +11·3m., T₀ = 13h.35m.5s. Osaka

MN = +12·3m. Tokyo gives P = +3m.14s. Riverview MN = +26·4m.

Ekaterinburg iP = +11m.18s., SR₁ = +26m.4s. Epicentre 13·47°N.

141·24'E. De Bilt eE = +33m.54s., MN = +66·3m. Rocca di Papa

(S) = +55m.8s. San Fernando MN = +77·0m.

Mar. 1d. Records also at 3h. (Rio de Janerio), 4h. (Athens and Rocca di Papa),
6h. (Riverview), 7h. (Ekaterinburg), 14h. (Coimbra), 15h. (Rocca di
Papa), 17h. (Ekaterinburg, Calcutta, and Helwan).

1919. Mar. 2d. 3h. 26m. 40s. (I) 11h. 45m. 10s. (II) Epicentre 41°·0S. 74°·0W.

A = +·208, B = -·725, C = -·656; D = -·961, E = -·276;

G = -·181, H = +·631, K = -·755.

(See note at end on possible deep focus).

	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
I Cipolletti	4·9	66	(1 8)	- 8	1 8	? P	—	3·8
II	4·9	66	—	—	(1 44)	-30	1·7	3·7
I Mendoza	9·3	31	5 50	? S	(5 50)	+90	8·6	10·1
II	9·3	31	5 14	? S	(5 14)	+64	8·1	10·1
I Pilar	E. 12·4	44	4 2	+57	—	—	8·1	10·1
I	N. 12·4	44	3 44	+39	—	—	7·9	9·6
II	E. 12·4	44	3 38	+33	—	—	7·7	9·2
II	N. 12·4	44	3 38	+33	—	—	7·9	10·6
I Andalgala	E. 14·8	27	3 32	- 4	—	—	6·8	9·3
I	N. 14·8	27	3 26	-10	—	—	6·8	11·5
II	14·8	27	4 2	+26	—	—	8·9	11·1
I La Paz	25·0	13	1 5 52	+14	i 10 56	+53	12·4	16·1
II	25·0	13	1 5 42	+ 4	10 20	+17	12·5	15·8
II Rio de Janerio	E. 31·6	64	e 6 44	+ 1	—	—	16·4	20·7
II	N. 31·6	64	e 6 32	-11	—	—	16·5	20·6
I Vieques	E. 59·6	10	—	—	—	—	33·0	36·8
I	N. 59·6	10	—	—	—	—	38·9	41·8
II	E. 59·6	10	13 36	? PR ₁	—	—	33·0	36·8
II	N. 59·6	10	—	—	—	—	38·0	40·6

(Continued on next page.)

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
II Ascension		62.0	75	—	—	—	—	38.8	—
I Capetown		70.2	118	11 20	+ 2	21 2	-31	37.5	50.5
II		70.2	118	11 2	-16	20 32	+ 4	10.5	50.0
I Cheltenham	E.	79.8	358	13 21	+63	22 53	-32	—	23.1
I	N.	79.8	358	12 41	+23	22 53	+32	51.8	—
I	E.	79.8	358	22 37	?8	(22 37)	-16	43.5	46.7
II	N.	79.8	358	22 35	?8	(22 35)	+14	45.6	51.8
I Georgetown		79.9	358	12 25	+ 7	22 38	+16	35.7	—
II	E.	79.9	358	12 36	-18	22 35	+13	36.0	—
II	N.	79.9	358	12 16	- 2	—	—	45.8	—
I Washington		79.9	358	12 20	- 2	22 31	9	41.5	—
II		79.9	358	12 16	- 2	22 18	- 4	35.7	—
I Harvard	E.	83.4	1	—	—	23 9	- 8	42.4	—
I	N.	83.4	1	i 12 39	+ 1	22 57	- 4	e 42.0	47.2
II	E.	83.4	1	11 50	-48	23 3	- 2	e 42.1	43.8
II	N.	83.4	1	i 12 41	- 3	23 3	+ 2	e 42.7	46.8
I Ithaca		83.5	358	12 38	- 1	23 0	- 3	e 35.2	—
II	E.	83.5	358	—	—	e 23 6	+ 3	e 38.2	—
I Chicago		83.6	350	12 41	+ 1	23 0	- 5	41.3	—
II		83.6	350	12 39	- 1	22 54	-11	44.8	—
I Ann Arbor	E.	83.7	354	14 32?	?	23 8	+ 2	36.5?	—
I	E.	83.7	354	—	—	23 8	+ 2	39.6	—
II	E.	83.7	354	—	—	23 2	- 4	35.8	38.2
II	N.	83.7	354	13 20?	-40	23 20	+14	35.1	37.8
II	E.	83.7	354	—	—	23 2	- 4	35.5	38.0
I Toronto		84.8	356	—	—	e 24 2	+45	41.1	73.4
II		84.8	356	15 56	?	i 24 8	+51	e 41.0	60.4
I Ottawa		86.4	359	i 12 56	+ 1	e 23 34	0	48.3	—
II		86.4	359	e 12 50	- 5	23 26	- 8	41.8	—
I Apia		86.7	257	e 12 56	- 1	—	—	e 40.4	—
II		86.7	257	—	—	e 22 26	-72	39.4	—
I Lick		89.6	323	—	—	—	—	e 42.3	—
II		89.6	323	—	—	—	—	e 43.3	—
I Berkeley		90.4	323	—	—	—	—	e 36.8	46.1
II		90.4	323	—	—	e 22 38	-100	—	46.0
I Sydney	E.	94.3	216	22 38	?8	30 50	?SR ₁	42.8	45.3
II	E.	94.3	216	22 32	?8	30 56	?SR ₁	42.7	45.2
I Riverview		94.4	216	e 12 36	-64	e 23 46	-74	42.3	44.8
II		94.4	216	e 13 23	-17	e 23 44	-76	e 41.9	44.8
I Adelaide		98.4	205	12 15	-107	24 27	-73	—	54.2
II		98.4	205	—	—	24 15	-85	—	54.8
I San Fernando		99.2	49	19 20	?PR ₁	—	—	51.3	61.3
II		99.2	49	17 38	?PR ₁	—	—	53.9	60.3
I Victoria		99.5	330	24 6	?8	31 58	?SR ₁	e 50.6	55.1
II		99.5	330	23 50	?8	31 12	?SR ₁	41.6	55.3
I Honolulu		99.5	290	25 8	?8	32 26	?SR ₁	47.8	52.3
II		99.5	290	23 56	?8	31 56	?SR ₁	46.8	51.8
I Rio Tinto		99.9	48	16 20	?	—	—	—	68.3
II		99.9	48	15 50	?	—	—	—	65.8
I Coimbra	N.	100.7	44	e 16 49	+155	27 17	+75	47.1	56.0
I	E.	100.7	44	17 50	?PR ₁	—	—	—	49.8
II	E.	100.7	44	e 17 2	?PR ₁	27 18	+76	48.0	59.3
II	N.	100.7	44	e 17 50	?PR ₁	27 18	+76	46.3	59.7
I Granada		101.2	50	i 16 50	+154	26 54	+47	—	—
I Mauritius	E.	104.3	133	24 14	?8	(24 14)	-142	49.9	52.2
I	N.	104.3	133	25 50	?8	(25 50)	-46	48.6	51.0
II	E.	104.3	133	22 26	?8	42 26	?	48.7	51.3
II	N.	104.3	133	23 50	?8	43 8	?	48.1	50.3
I Algiers		104.9	53	e 17 56	?8	25 0	-101	40.3	60.3
II		104.9	53	e 18 34	?8	—	—	i 48.8	60.8
I Tortosa		106.1	49	20 27	?PR ₁	—	—	38.3	65.9
II		106.1	49	18 40	?PR ₁	28 5	+72	36.3	64.8
I Barcelona		107.4	50	e 18 25	[+12]	27 59	+54	e 47.9	62.3
II		107.4	50	e 17 41	[-32]	—	—	e 32.9	61.8
I Marseilles		110.4	48	—	—	e 51 20	?L	61.3	69.3
II		110.4	48	—	—	e 51 50	?L	63.8	64.8
I Shide		111.5	40	—	—	i 28 56	-74	61.1	66.8
II		111.5	40	—	—	i 28 54	+72	61.2	65.1
I Oxford		112.1	40	—	—	—	—	62.5	64.9
I Paris		112.2	43	—	—	e 29 35	+107	52.3	64.3
II		112.2	43	—	—	—	—	e 53.8	60.8
I Kew		112.4	39	—	—	—	—	—	72.3
II		112.4	39	—	—	—	—	—	74.8

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
I Bidston	112.4	37	—	—	19 26	?PR ₁	—	65.1
II 112.4	37	15 50	+41	—	—	—	—	62.3
I Moncalieri	112.7	49	19 3	?PR ₁	29 35	+103	51.4	69.2
II 112.7	49	20 28	?PR ₁	i 29 34	+102	—	38.9	68.4
I Besançon	113.1	45	—	—	—	—	62.3	—
II 113.1	45	—	—	—	—	—	63.8	—
I Eskdalemuir	113.4	36	—	—	29 28	+91	56.3	66.8
II 113.4	36	—	—	—	29 25	+88	57.3	62.8
I Edinburgh	113.8	35	19 20	?PR ₁	—	—	—	64.8
II 113.8	35	19 20	?PR ₁	—	—	—	—	64.3
I Rocca di Papa	113.8	53	e 19 36	?PR ₁	e 29 23	+83	e 55.7	65.4
II 113.8	53	e 19 41	?PR ₁	29 21	+81	e 59.7	65.7	—
I Florence	114.1	50	e 19 8	?PR ₁	—	—	54.3	62.3
II 114.1	50	19 50	?PR ₁	29 50	+107	49.8	54.8	—
I Uccle	114.3	41	e 19 38	?PR ₁	e 29 44	+100	e 51.3	68.3
II 114.3	41	19 40	?PR ₁	e 29 32	+88	e 49.8	67.8	—
I Pompeii	114.4	55	19 22	?PR ₁	29 20	+75	61.3	65.3
II 114.4	55	19 12	?PR ₁	—	—	—	56.8	64.8
I Zurich	114.6	48	—	—	—	—	e 62.2	—
I Strasbourg	114.8	46	e 19 55	?PR ₁	—	—	64.3	73.3
II 114.8	46	—	—	—	—	—	63.8	68.8
I Dyce	115.1	34	—	—	i 41 17	?SR ₁	64.3	68.2
II 115.1	34	—	—	—	i 30 8	+117	62.8	67.8
I De Bilt	E. 115.4	40	—	—	e 29 51	+98	e 55.3	68.2
II 115.4	40	—	—	—	e 29 54	+101	—	67.3
I 115.4	40	—	—	—	e 29 46	+93	e 52.8	67.9
II 115.4	40	—	—	—	e 29 45	+92	—	67.3
I Hamburg	118.8	40	e 20 20	?PR ₁	—	—	e 61.3	74.5
II 118.8	40	—	—	—	—	—	e 66.8	71.8
I Helwan	E. 120.0	76	e 20 20	?PR ₁	—	—	—	81.0
II 120.0	76	20 20	?PR ₁	—	—	—	—	79.6
I Lemberg	124.7	50	—	—	—	—	e 69.7	75.2
I Batavia	132.8	180	e 22 41	?PR ₁	—	—	e 69.4	—
II 132.8	180	e 22 32	?PR ₁	—	—	—	e 68.8	—
I Colombo	138.6	137	68 38	?L	72 26	?	(68.6)	99.3
I Kodaikanal	140.2	131	75 8	?L	—	—	77.6	93.0
II 140.2	131	75 32	?L	—	—	—	83.0	90.9
I Bombay	144.1	119	71 41	?L	—	—	(71.7)	88.1
II 144.1	119	19 23	[-24]	—	—	—	—	88.2
I Ekaterinburg	147.3	44	e 19 46	[-6]	i 33 14	+90	63.3	87.7
II 147.3	44	i 19 46	[-6]	30 16	-88	40.8	51.4	—
I Manila	150.6	210	e 19 53	[-4]	—	—	—	—
II 150.6	210	e 19 50	[-7]	—	—	—	—	—
I Osaka	156.0	264	—	—	51 18	?	—	77.8
II 156.0	264	—	—	—	30 33	?	—	86.7
I Taihoku	159.4	224	e 12 33	?	—	—	—	79.8
I Zi-ka-wei	164.2	237	—	—	e 29 59	?	e 75.0	—
II 164.2	237	e 25 32	?PR ₁	e 37 56	?	55.0	87.0	—

Additional records: Cipolletti I and Mendoza II appear to record 10m. early. Andalgala II gives MN = +11.4m. La Paz (I), MN = +16.3m, T₀ = 3h.26m.47s. Epicentre 42° 28' 73.5W. La Paz II iSE = +10m.21s., LN = +12.4m., T₀ = 11h.45m.4s. Epicentre 42° 28' 73.5W. Ascension II gives records at +64m.50s. and +74m.50s. Georgetown I LE = +46.5m., LN = +51.5m., T₀ = 3h.26m.50s. Georgetown II LE = +43.0m., T₀ = 11h.45m.5s. Washington I L = +51.3m., T₀ = 3h.26m.47s. Washington II SR₁ = +27m.50s., L = +41.8m. and +50.8m., T₀ = 11h.45m.22s. Harvard I iE = +27m.59s. and four other L's, T₀ = 3h.26m.59s. Harvard II iE = +23m.13s., iN = +23m.19s., eE = +28m.3s., T₀ = 11h.45m.27s. Ithaca II eN = +22m.57s., eE = +28m.35s. Chicago I L? = +35.5m., L = +48.3m. and +64.3m., T₀ = 3h.27m.0s. Chicago II L = +35.5m., +58.3m., and +64.8m., T₀ = 11h.45m.32s. Toronto I PR₁? = +19m.56s., eL = +67.3m. Toronto II S = +25m.50s. and +30m.14s., L = +52.2m., iL = +58.4m., eL = +63.6m. Ottawa I eSN = +23m.19s., eL = +43.3m., L = +58.3m. and +63.3m., T₀ = 3h.27m.11s. Ottawa II SR₁ = +29m.32s., L = +44.8m. and +54.8m., T₀ = 11h.45m.21s. Apia II c₂ = +28m.56s. Riverview I MZ = +47.3m. Riverview II PS = +25m.52s., eSR₁ = +30m.27s. and +31m.23s., MN = +44.7m., MZ = +47.0m. Adelaide II, SR₁ = +30m.56s. San Fernando II MN = +61.0m. Victoria I L = +43.8m., MZ = +50.7m. Victoria II MZ = +55.3m. Coimbra I Milne record P = +13m.30s., S = +27m.20s., M = +50.9m. Coimbra II Milne record P = +13m.27s., S = +27m.31s., L = +47.8m., M = +57.3m. Algiers II (?) = +28m.2s. Paris II MN = +67.8m. Moncalieri I MN? = +66.9m. Moncalieri II MN = +67.2m. Eskdalemuir I PR₁? = +19m.44s. Dyce I LN = +63.3m. De Bilt I ePR₁ = +20m.7s.

Notes continued on next page.

De Bilt II ePR₁ = +20m.4s. Hamburg I MN = +75.5m. Helwan I PN = +22m.2s., MN = +72.1m. Helwan II PN = +21m.14s., MN = +80.3m.,
 Lemberg I 74m.2s. Batavia I eL₂ = +78.6m., eL₃ = +83.7m. Batavia II eL₂ = +78.8m., eL₃ = +83.8m. Kodaikanal II gives P = +22m.14s. (ePR₁) as part of an earlier shock. Ekaterinburg I II' = -19m.48s., I₁ = +23m.2s., I₂ = +26m.32s., I₃ = +30m.12s., I₄ = +36m.4s. Epicentre 28° 30' S, 160° 19' E. Osaka I MN = +87.2m. Osaka II MN = +88.7m. Zi-ka-wei gives its eL one hour early. Zi-ka-wei II SR₁E = +45m.0s., SR₁N = +51m.57s., MN = +83.6m.

NOTE TO 1919 MAR. 2 AND 9.

Some of the residuals for the stations nearest the epicentre are so large as to raise doubts whether the solution is even approximately correct. It seems well therefore to call attention to the following points. The residuals for six N. American stations are as follows:—

	Δ	Az.	P Residuals.			S Residuals.		
			2d.3h.	2d.11h.	9d.	2d.3h.	2d.11h.	9d.
Georgetown	79.9	358	+7	-8	—	-16	+13	+5
Washington	79.9	358	+2	-2	-4	+9	-4	0
Harvard	83.4	1	+1	+3	+1	-2	+2	-3
Ithaca	83.5	358	-1	—	—	-3	-3	-17
Chicago	83.6	350	-1	-1	-7	-5	-11	-2
Ottawa	86.4	359	+1	-5	+2	0	-8	-8
Mean			+2	+1	0	+3	-1	-3

- (1) In view of this concurrent testimony it seems clear that no great alteration of T₀ can be made in any of the three cases.
- (2) The latitude of the epicentre is checked by these stations which lie close to zero azimuth.
- (3) The longitude may be inaccurate, but the residuals for Apia (-1s. for P on Mar. 2d. 3h. and -12s. for S on Mar. 2d. 11h.) in Azimuth 257° are reassuring on this point.
- (4) Nevertheless La Paz has the residuals

	Δ	Az.	P.	S.
La Paz	25.0	13	+14s. +4s. +15s.	+53s. +17s. +30s.

The mean value in P is +11s. and in S +33s., indicating that the epicentre should be moved 1°.1 or 1°.8 further away from La Paz. Yet we cannot do this without upsetting the accordance of the N. American stations. As regards other S. American stations:—

Cipolletti and Rio de Janeiro are in azimuths 66° and 64°: they support Apia that the longitude of the epicentre is well determined, but tell us little about latitude. Mendoza is affected by some large error of 3 or 4 min. Pilar in azimuth 44° would support La Paz in requiring a latitude further south; but contradicts Apia, Cipolletti, and Rio de Janeiro as regards the longitude.

Andalgala has P residuals -7s. +26s. +57s. The mean value supports La Paz, but the discordances from the mean show that the accidental error is also large.

Vieques gives us no help.

- (5) If we accept the La Paz observations as requiring an epicentre further S. than those of N. America, the only way of reconciling them is by supposing a focus below normal depth. With a depth of 0.020 the epicentre might be moved 2°.7 further South (to 43°.7): and the new Δ for La Paz would be effectively

$$25^{\circ}.0 \text{ (above)} + 2^{\circ}.7 \text{ (new latitude)} - 1^{\circ}.2 \text{ (deep focus)} = 26^{\circ}.5;$$

while that of a N. American station, say Washington, would be effectively

$$79^{\circ}.9 \text{ (above)} + 2^{\circ}.7 \text{ (new latitude)} - 2^{\circ}.7 \text{ (deep focus)} = 79^{\circ}.9.$$

- (6) It may be remarked that this alteration of epicentre brings the focus nearer to Riverview and Adelaide, which lie near azimuth 180° . The effective Δ for Riverview is thus doubly altered

$$94^\circ.4 \text{ (above)} - 2^\circ.3 \text{ (new latitude)} - 2^\circ.8 \text{ (deep focus)} = 89^\circ.3.$$

The large negative residuals

$$\begin{array}{llll} \text{in P} & -64\text{s.} & -17\text{s.} & -15\text{s.} \quad \text{now become} \quad -36\text{s.} \quad -11\text{s.} \quad -23\text{s.} \\ \text{in S} & -74\text{s.} & -76\text{s.} & -64\text{s.} \quad \quad \quad -20\text{s.} \quad -22\text{s.} \quad -10\text{s.} \end{array}$$

which is a considerable improvement.

The residuals are still negative and call for a displacement of the epicentre further West to correct them. And this would be supported by Apia, &c., which lie to the East: the increase in Δ for them would be balanced by the correction for focal depth.

- (7) The only values of [P] are for Bombay, Ekaterinburg, and Manila, and show a mean value $[-9\text{s.}]$. For a focal depth $.020$ this should be about $[-17\text{s.}]$.

The evidence taken together therefore points to a moderate focal depth (0.020), though not very strongly; and to an epicentre at (say) $43^\circ.7\text{S. } 77^\circ.0\text{W.}$

Mar. 2d. 16h. 56m. 50s. Epicentre $34^\circ.0\text{N. } 96^\circ.0\text{E.}$ (as on 1915 April 28d.).

$$A = -.087, B = +.824, C = +.559.$$

		Δ	P.	O-C.	S.	O-C.	L.
			m. s.	s.	m. s.	s.	m.
Calcutta	E.	12.2	2 58	- 4	5 22	- 2	—
	N.	12.2	2 52	-10	5 22	- 2	—
Zi-ka-wei		21.5	e 4 57	- 2	e 9 11	+16	—
Manila		29.9	—	—	—	—	e 14.2
Helwan		54.1	38 10	?L	—	—	(38.2)

Helwan gives PN = +33m.10s.

Mar. 2d. Records also at 2h. (La Paz), 4h. (Colombo), 5h. (Pola), 10h. (Simla), 13h. (Pola), 19h. (La Paz).

Mar. 3d. Records at 1h. (San Fernando), 2h. (Zi-ka-wei, Batavia, and Manila), 3h. (Ekaterinburg and Helwan), 6h. (Ekaterinburg, Helwan, and Calcutta), 10h. (Batavia), 11h. (Bidston), 15h. (Helwan), 16h. (Batavia), 21h. (Pompeii).

Mar 4d. 8h. 1m. 25s. Epicentre $48^\circ.0\text{S. } 134^\circ.0\text{E.}$

$$A = -.465, B = +.481, C = -.743; \quad D = +.719, E = +.695; \\ G = -.514, H = -.535, K = -.669.$$

		Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview		19.1	49	e 4 30	0	e 8 5	+ 1	e 9.2
Sydney	E.	19.1	49	4 47	+17	(8 5)	+ 1	8.1
Colombo		72.5	303	41 35	?L	—	—	(41.6)
Capetown		79.9	229	38 53	?L	—	—	(38.9)
Honolulu		92.1	60	—	—	—	—	46.6
La Paz		112.5	158	58 12	?L	59 26	?	60.0
Victoria		130.8	59	62 20	?L	—	—	(62.3)
Rocca di Papa	E.	139.0	284	e 16 53	-14	—	—	—
	N.	139.0	284	i 17 5	- 2	—	—	—
Algiers		142.8	270	—	—	—	—	79.6
Moncalieri		143.7	285	—	—	—	—	87.4
De Bilt		147.6	297	—	—	e 41 59	?SR ₁	e 82.6
Paris		148.4	290	—	—	—	—	81.6
San Fernando		148.8	263	76 35	?L	—	—	81.8
Kew		150.8	294	—	—	—	—	—
Coimbra		152.2	268	—	—	68 59	?	77.1
Eskdalemuir		153.0	302	—	—	42 35	?SR ₁	—
Toronto		156.5	88	—	—	—	—	77.4

Additional records: Riverview gives MZ = +14.2m. La Paz probably records a separate shock. Rocca di Papa ePN = +34m.44s., ePE = +34m.50s., M = +35.7m., also eL = +63.6m. De Bilt MN = +92.4m.

Mar. 4d. Records also at 0h. (Lick), 3h. (Balboa Heights), 6h. (Helwan), 7h. (Batavia), 10h. (Ekaterinburg), 12h. (Tokyo and Mizusawa), 22h. (Lick and Helwan).

Mar. 5d. Records at 1h. (Helwan and San Fernando), 16h. (Ekaterinburg), 20h. (Honolulu), 21h. (Ekaterinburg and Rocca di Papa), 23h. (Tokyo).

Mar. 6d. 3h. 13m. 53s. Epicentre $3^{\circ}48'S$, $118^{\circ}5'E$. (adopted from Batavia).

$$\begin{aligned} \Lambda &= -.476, B = +.877, C = -.059; & D &= -.879, E = +.477; \\ G &= +.028, H = -.052, K = -.998. \end{aligned}$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Batavia	11.9	256	2 58	0	6 30	?L	(6.5)	8.2
Manila	18.1	8	4 19	+ 1	—	—	7.5	8.0
Perth	28.6	185	—	—	12 38	+88	—	—
Colombo	39.9	285	12 7	?	—	—	—	30.1
Ekaterinburg	76.0	331	i 11 49	- 6	i 21 28	- 9	32.1	35.6
De Bilt	106.9	324	—	—	e 28 7	+67	e 58.1	69.3
La Paz	159.1	162	27 43	?	—	—	—	—

Manila gives MN = +7.6m.

Batavia records the adopted T_0 and epicentre.

Ekaterinburg gives its record as 4h. instead of 3h., and records epicentre $8^{\circ}49'S$, $107^{\circ}5'E$.

De Bilt MN = +59.8m.

Mar. 6d. 13h. 12m. 4s. Epicentre $36^{\circ}7'N$, $21^{\circ}0'E$. (as on 1919 Feb. 24d.).

$$\Lambda = +.749, B = +.287, C = +.598.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	2.5	e 0 38	- 1	e 1 9	0	i 1.6	2.0
Pompeii	6.4	2 56	?S	(2 56)	+ 1	6.9	—
Rocca di Papa	8.1	e 2 3	0	—	—	—	3.2
Strasbourg	15.3	e 4 13	+30	—	—	—	—
De Bilt	19.0	—	—	e 8 50	+48	e 13.9	15.3
Ekaterinburg	33.1	—	—	—	—	15.4	—

De Bilt gives MN = +15.1m.

Mar. 6d. Records also at 0h. (Helwan and Ekaterinburg), 4h. (Batavia), 6h. (Paris), 7h. (Batavia, Manila, and Ekaterinburg), 8h. (De Bilt), 21h. (Mizusawa, San Fernando, and Tokyo).

Mar. 7d. Records at 1h. (Ekaterinburg, Batavia, and Manila), 2h. (Helwan), 11h. (Ekaterinburg and La Paz), 19h. (Tokyo and Mizusawa), 20h. (Ekaterinburg), 23h. (Batavia).

Mar. 8d. Records at 0h. (Mizusawa), 1h. (Mizusawa and Ekaterinburg), 4h. (La Paz), 10h. (Rocca di Papa), 12h. (Rocca di Papa and Mendoza), 18h. (Manila and La Paz), 22h. (Rocca di Papa).

1919. Mar. 9d. 3h. 16m. 45s. Epicentre $41^{\circ}0'S$, $74^{\circ}0'W$.

(As on 1919 Mar. 2d.: See note on that date suggesting $43^{\circ}7'S$, $77^{\circ}0'W$, with focal depth 0.020).

$$\begin{aligned} \Lambda &= +.208, B = -.725, C = -.656; & D &= -.961, E = -.276; \\ G &= -.181, H = +.631, K = -.755. \end{aligned}$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Cipolletti	4.9	66	—	—	—	—	0.1	1.8
Mendoza	9.3	31	5 3	?S	(5 3)	+53	8.0	10.4
Andalgala	E. 14.8	27	7 33	?L	—	—	8.8	12.2
	N. 14.8	27	4 33	+57	—	—	9.0	12.0
La Paz	E. 25.0	13	e 5 55	+17	i 10 31	+28	12.9	16.7
	N. 25.0	13	i 5 51	+13	i 10 35	+32	12.9	16.4
Rio de Janeiro	E. 31.6	64	e 7 3	+20	12 45	+44	16.8	22.8
	N. 31.6	64	e 6 39	- 4	12 39	+38	17.2	20.6
Vieques	E. 59.6	10	—	—	—	—	33.2	35.1
	N. 59.6	10	—	—	—	—	40.2	40.8

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Capetown		70.2	118	11 45	+27	31 45	?	44.8	48.0
Cheltenham	E.	79.8	358	21 59	?S	(21 59)	-22	43.9	—
	N.	79.8	358	22 2	?S	(22 2)	-19	45.0	—
Washington	N.	79.9	358	12 22	+4	22 22	0	e 42.2	—
Georgetown	E.	79.9	358	—	—	22 27	+5	e 43.2	—
Harvard	E.	83.4	1	—	—	23 7	+6	e 42.6	54.9
	N.	83.4	1	12 39	+1	23 1	0	—	—
Ithaca	E.	83.5	358	—	—	e 22 46	-17	e 38.9	—
Chicago		83.6	350	12 33	-7	23 3	-2	44.2	—
Ann Arbor	E.	83.7	354	—	—	25 51	+165	46.8	52.2
Toronto		84.8	356	11 57	-50	i 24 15	+58	e 42.8	49.8
Ottawa		86.4	359	12 57	+2	23 26	-8	e 43.2	—
Apia		86.7	257	—	—	—	—	39.6	—
Berkeley		90.4	323	—	—	—	—	e 39.8	—
Sydney	E.	94.3	216	19 45	?PR ₁	—	—	44.6	46.2
Riverview		94.4	216	12 49	-51	23 56	-64	44.2	48.4
Adelaide		98.4	205	—	—	24 59	-41	44.8	55.7
San Fernando		99.2	49	24 27	?S	(24 27)	-21	57.8	64.2
Honolulu		99.5	290	25 51	?S	34 3	?SR ₁	46.2	53.0
Victoria		99.5	330	33 49	?SR ₁	40 16	?	47.7	56.1
Rio Tinto		99.9	48	18 15	?PR ₁	—	—	—	78.2
Coimbra		100.7	44	17 29	?PR ₁	27 23	+81	47.8	50.2
Algiers		104.9	53	e 18 51	?PR ₁	25 8	-93	51.2	59.8
Perth		106.5	189	—	—	37 29	?SR ₁	—	—
Barcelona		107.4	50	—	—	e 26 45	-20	e 50.4	65.2
Marseilles		110.4	48	—	—	—	—	e 61.8	65.2
Shide		111.5	40	19 26?	?PR ₁	29 1	+79	—	69.6
Oxford		112.1	40	—	—	—	—	62.9	65.6
Paris		112.2	43	—	—	e 53 15	?L	62.2	63.2
Bidston		112.4	37	—	—	29 15	+86	—	55.0
Kew		112.4	39	—	—	—	—	—	75.2
Moncalieri		112.7	49	19 33	?PR ₁	29 40	+108	55.2	69.5
Edinburgh		113.8	35	20 15	?PR ₁	—	—	—	64.2
Rocca di Papa		113.8	53	e 19 42	?PR ₁	e 29 31	+91	e 60.9	68.0
Florence		114.1	50	19 42	?PR ₁	—	—	—	59.2
Uccle		114.3	41	—	—	—	—	e 52.2	70.2
Pompeii		114.4	55	19 49	?PR ₁	—	—	63.2	71.3
Strasbourg		114.8	46	—	—	e 22 5	?	—	—
Dyce		115.1	34	—	—	—	—	73.2	—
De Bilt		115.4	40	—	—	e 29 55	+102	e 55.2	68.7
Pola		116.3	50	e 29 52	?S	(e 29 52)	+92	e 58.9	74.0
Hamburg		118.8	40	—	—	—	—	e 65.2	73.2
Vienna		119.5	49	—	—	—	—	e 70.2	71.2
Helwan		120.0	76	21 9	?PR ₁	—	—	—	81.2
Lemberg		124.7	50	—	—	—	—	e 73.6	75.2
Colombo		138.6	137	70 15	?L	—	—	89.2	99.2
Kodaikanal		140.2	131	41 9	?SR ₁	—	—	77.4	93.8
Manila		150.6	210	e 19 59	[+2]	—	—	—	—
Sinla		154.8	103	e 75 9	?L	—	—	(e 75.2)	—
Taihoku		159.4	224	—	—	—	—	e 74.8	—
Zi-ka-wei		164.2	237	e 24 55	?PR ₁	—	—	—	—

Additional records : La Paz gives iN = +11m.26s., T₀ = 3h.16m.43s., epicentre 42° 58', 73° 5' W. Harvard LE = +45.5m., T₀ = 3h.17m.0s. Ithaca eN = +22m.55s. Chicago L? = +38.2m. and 62.2m., T₀ = 3h.16m.46s. Ann Arbor sN = +26m.3s., LN = +47.2m. Toronto PR₁ = +18m.21s., iS = +30m.3s., eL = +54.0m. and +57.8m. Ottawa PR₁N = +16m.27s., SE = +23m.40s., L = +55.2m., and four other L's. T₀ = 3h.17m.10s. Riverview PS = +25m.59s., MN = +46.8m., MZ = +47.3m., T₀ = 3h.16m.27s. Adelaide SR₁ = +31m.41s.?. San Fernando MN = +62.2m. Coimbra LN = +47.2m. Barcelona eL = +28.6m., M = +29.8m. Paris MN = +71.2m. Moncalieri MN = +68.8m. De Bilt ePR₁ = +20m.9s., MN = +68.8m. Pola gives its records at 4h. (Central European time?). The Taihoku record has been assumed one hour too early.

Mar. 9d. Records also at 4h. (Tucson), 5h. (Ekaterinburg), 8h. (Ekaterinburg and Helwan), 15h. (Ekaterinburg, Batavia, and Helwan), 19h. (Helwan and Ekaterinburg).

Mar. 10d. 21h. 19m. 45s. Epicentre $27^{\circ}5'N$. $123^{\circ}5'E$.

$$A = -490, B = +740, C = +462; \quad D = +834, E = +552; \\ G = -255, H = +385, K = -887.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	3.0	216	—	—	1 33	+10	2.4	2.7
Zi-ka-wei	4.1	334	1 53	?S	(1 53)	0	(2.8)	4.1
Kobe	12.2	51	3 6	+ 1	—	—	—	7.8
Osaka	12.5	52	3 8	+ 2	—	—	—	8.1
Manila	13.2	191	3 18	+ 2	5 55	+ 6	6.7	7.2
Tokyo	16.0	56	4 1	+ 9	6 29	-26	—	—
Mizusawa	N. 18.7	47	4 11	-14	7 38	-17	—	—
Batavia	37.4	208	e 7 26	- 7	—	—	—	14.4
Colombo	46.2	251	15 15	?S	(15 15)	-16	—	—
Ekaterinburg	52.6	321	i 9 29	+ 5	16 53	+ 2	25.2	29.9
Riverview	66.7	155	—	—	e 19 16	-30	e 31.6	38.8
Honolulu	70.6	75	18 57	?S	(18 57)	-96	e 35.2	45.2
Lemberg	75.0	319	—	—	—	—	e 39.6	41.2
Helwan	E. 78.5	298	19 15	?S	(19 15)	-171	—	—
Hamburg	80.8	327	—	—	—	—	e 42.2	44.2
De Bilt	84.0	327	—	—	e 29 39	?SR ₁	e 48.2	49.3
Bidston	86.8	331	23 51	?S	(23 51)	+12	—	48.8
Moncalieri	87.0	320	—	—	e 38 1	?	50.4	—
San Fernando	N. 100.5	320	24 15	?S	(24 15)	-106	—	—

Additional records: Osaka gives MN = +7.8m. Manila MN = -7.4m. T₀ = 21h.19m.49s. Ekaterinburg i = -17m.41s., PR₁ = +19m.5s., SR₁ = +20m.45s., SR₂ = +22m.4s., i = +23m.29s., epicentre $31^{\circ}0'N$. $127^{\circ}29'E$. Helwan PN = +20m.15s. Hamburg MN = +48.2m. De Bilt MN = +51.7m. Bidston gives S = +30m.15s. ?SR₁.

Mar. 10d. Records also at 1h. (Taihoku and San Fernando), 9h. (Mendoza), 17h. (Colombo), 18h. (Helwan), 19h. (Manila, Ekaterinburg, and Nagasaki), 20h. (Helwan).

Mar. 11d. Records at 0h. (Rocca di Papa), 6h. (La Paz), 8h. (Helwan, Ekaterinburg, and Manila), 10h. (Batavia), 14h. (Taihoku).

Mar. 12d. 10h. 31m. 5s. Epicentre $44^{\circ}5'N$. $140^{\circ}0'E$.

$$A = -546, B = +458, C = +701; \quad D = +643, E = +766; \\ G = -537, H = +451, K = -713.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	2.9	42	1 17	?S	(1 17)	- 3	1.8	1.9
Mizusawa	E. 5.5	170	1 28	+ 3	2 21	-10	—	—
Tokyo	N. 5.5	170	1 27	+ 2	2 22	- 9	—	—
Tokyo	8.9	181	3 29	?S	(3 29)	-32	—	—
Osaka	10.5	201	3 12	?S	(3 12)	-91	4.9	6.1
Zi-ka-wei	19.7	233	e 4 48	+11	e 9 32	+75	—	—
Ekaterinburg	48.8	314	e 8 57	- 2	i 16 1	- 3	24.9	—

Osaka gives MN = +6.2m.

Mar. 12d. Records also at 0h. (Ekaterinburg and De Bilt), 3h. (San Fernando), 5h. (Ekaterinburg and De Bilt), 9h. (Ekaterinburg, Strasbourg, and De Bilt), 12h. (La Paz), 13h. (Helwan), 20h. (San Fernando), 22h. (Helwan).

Mar. 13d. 13h. 9m. 30s. Epicentre $45^{\circ}0'N$. $120^{\circ}0'E$. (as on 1917 July 31d.).

$$A = -354, B = +612, C = +707.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Kobe	15.5	—	—	6 37	- 7	e 8.3	9.1
Osaka	15.6	—	—	6 40	- 6	8.4	9.1
Tokyo	17.0	4 21	+16	7 26	+ 8	—	7.6

No additional records.

Mar. 13d. 14h. 16m. 55s. Epicentre $8^{\circ}58'. 124^{\circ}5'E.$

$$\Delta = -.560, B = +.815, C = -.148; \quad D = +.824, E = +.566;$$

$$G = +.084, H = -.122, K = -.989.$$

An extra depth of focus is suggested, but the material is scanty.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	17.6	276	4 13	+ 1	—	—	—	9.6
Manila	23.4	351	e 5 19	- 2	—	—	9.8	9.9
Riverview	35.3	141	i 7 1	-15	12 31	-29	e 14.8	21.5
Colombo	47.1	289	30 5	?L	—	—	(30.1)	—
Ekaterinburg	83.4	331	i 12 22	-16	i 22 30	-31	30.1	—
Helwan	97.0	300	18 5	?PR ₁	—	—	—	—
La Paz	152.0	154	18 54	[-65]	—	—	—	—

Additional records : Manila gives MN = +10.2m. Riverview S = +13m.17s.,
MN = +19.8m., MZ = +19.7m. Helwan PN = +17m.5s.

Mar. 13d. Records also at 9h. (Hamburg, De Bilt, and Ekaterinburg), 15h. (Riverview), 16h. (La Paz), 17h. (Lick and Helwan), 20h. (Helwan), 21h. (Coimbra), 23h. (Osaka and Ekaterinburg).

Mar. 14d. Records at 1h. (Lick and San Fernando), 6h. (Mizusawa), 7h. (Manila), 12h. (Taihoku), 14h. (Mizusawa, Ootomari, and Ekaterinburg), 15h. (Hamburg, Honolulu, De Bilt, and Vienna), 17h. (Ekaterinburg, Apia, and Riverview), 18h. (Denver and De Bilt), 23h. (Nagasaki).

Mar. 15d. Records at 1h. (San Fernando), 9h. (La Paz), 12h. (Osaka), 14h. (Manila), 16h. (La Paz), 18h. (Ekaterinburg and San Fernando), 19h. (Denver), 21h. (Batavia), 22h. (Ekaterinburg and Helwan).

1919. Mar. 16d. 7h. 33m. 10s. Epicentre $9^{\circ}5'N. 127^{\circ}0'E.$
(as on 1918 July 1d.).

$$\Delta = -.594, B = +.788, C = +.165; \quad D = +.799, E = +.602;$$

$$G = -.099, H = +.132, K = -.986.$$

A depth of focus 0.015 has been assumed.

Station and Component.	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Manila	-0.1	7.8	311	e 2 4	+ 7	4 0	+31	4.6	6.2
Taihoku	-0.5	16.4	342	4 15	+24	(7 25)	+32	7.4	7.7
Zi-ka-wu i	-0.7	22.3	347	e 5 1	+ 1	8 19	-38	—	—
Batavia	-0.3	25.5	233	5 22	13	10 2	+ 5	—	11.9
Kobe	-0.8	26.2	15	5 50	+ 8	—	—	12.7	16.4
Osaka	-0.8	26.4	16	5 59	+15	(10 59)	+45	11.0	19.1
Tokyo	-0.9	28.6	21	9 39	?	12 38	? 1	(12.6)	19.3
Mizusawa	L. 1.1	32.2	21	6 42	+ 3	11 50	- 3	—	—
	N. -1.1	32.2	21	6 35	- 4	11 54	+ 1	—	—
Calcutta	N. -1.0	39.3	295	7 32	- 8	13 38	- 4	—	—
Ootomari	1.3	39.5	17	e 7 49	9	—	—	—	—
Perth	-1.4	42.8	193	—	—	13 54	-33	—	—
Adelaide	-1.4	45.8	167	8 14?	-15	14 34	-33	23.5	27.7
Colombo	-1.4	46.8	271	8 50	+ 14	15 50	+30	23.8?	33.5
Kodaikanal	E. 1.5	48.8	275	15 14	?S	(15 14)	-31	19.0	35.0
Riverview	1.5	49.0	153	e 8 49	2	15 35	-13	e 24.5	26.4
Sydney	E. -1.5	49.0	153	14 20	?S	(14 20)	-88	25.8	29.0
Apia	-1.9	65.1	110	—	—	e 19 26	+23	31.8	—
Ekaterinburg	2.0	69.3	329	i 11 3	+ 3	i 20 9	+15	29.8	39.4
Honolulu	-2.0	72.7	70	10 50	-31	20 44	+10	e 32.8	43.6
Helwan	-2.1	90.2	300	13 8	+ 2	—	—	—	62.1
Vienna	-2.2	96.3	321	i 12 11	.88	(25 50)	+53	e 25.8	—
Hamburg	-2.2	97.7	329	—	—	e 24 40	31	e 51.8	59.8
Berkeley	-2.2	100.0	49	—	—	—	—	e 44.7	—
Rocca di Papa	-2.2	100.8	316	e 17 56	[+ 7]	—	—	—	19.5

Continued on next page.

Station and Component.	Corr. for Focus	Δ	Az.	P.		O-C.		S.		O-C.		L.	M.
				m.	s.	m.	s.	m.	s.	m.	s.	m.	m.
De Bilt	E. 2.2	101.0	328	—	—	—	—	e 24	53	-51	—	e 51.8	56.3
	N. 2.2	101.0	328	—	—	—	—	—	—	—	—	e 48.8	55.4
Strasbourg	2.2	101.4	322	—	—	—	—	e 34	50	? SR ₁	—	—	—
Uccle	2.2	102.1	327	—	—	—	—	—	—	—	—	e 54.8	—
Edinburgh	2.2	102.9	324	27	50	? S	—	27	50	+109	—	—	58.8
Moncalieri	-2.2	103.0	321	18	36	? PR ₁	—	—	—	—	—	51.3	68.8
Eskdalemuir	-2.2	103.2	333	—	—	—	—	26	50	+45	—	—	—
Kew	-2.2	104.1	329	—	—	—	—	—	—	—	—	—	74.8
Bidston	-2.2	104.2	332	34	2	? SR ₁	—	—	—	—	—	—	57.5
Paris	-2.2	104.2	326	—	—	—	—	—	—	—	—	e 54.8	60.8
Shide	-2.2	105.1	328	—	—	—	—	—	—	—	—	56.6	—
Rio Tinto	-2.3	115.9	320	28	50	? S	—	(28 50)	—	51	—	—	80.8
San Fernando	-2.3	116.4	319	—	—	—	—	—	—	—	—	—	83.8
Ottawa	—	121.4	19	—	—	—	—	37	8	? SR ₁	—	e 56.8	—
Toronto	—	121.7	22	—	—	—	—	—	—	—	—	e 74.4	—
La Paz	—	163.7	117	20	14	[+ 3]	—	34	23	?	—	79.8	81.7

Additional records : Manila gives MN = +6.3m., T₀ = 7m.32m.52s., Epicentre 6° 5' N. 127° 0' E., Osaka MN = +16.1m., Perth gives its record as 6h. instead of 7h., Adelaide SR₁ = +17m.59s., Riverview PR₁ = -10m.42s., eS = -15m.42s., PS = -16m.7s., eSR₁ = -18m.49s., and -19m.19s., MN = +27.7m., MZ = -35.9m., T₀ = 7h.33m.26s., Sydney S = -19m.8s., Colombo L? = -31.8m., Ekaterinburg PR₁ = -13m.43s., PR₂ = -15m.29s., iPS = -20m.57s., SR₁ = +24m.26s., Epicentre 3 51' N. 118° 4' E., Helwan PN = +14m.14s., MN = +63.6m., Moncalieri MN = -71.2m.

Mar. 16d. 15m. 3m. 0s. Epicentre 9° 5' N. 127° 0' E. (as at 7h.).

A = -.594, B = -.788, C = +.165; D = -.799, E = -.602;
G = -.099, H = +.132, K = -.986.

The deep focus of 7h. is retained, although the evidence itself is in this case insufficient to justify any assumption of the kind.

	Corr. for Focus	Δ	Az.	P.		O-C.		S.		O-C.		L.	M.
				m.	s.	m.	s.	m.	s.	m.	s.	m.	m.
Manila	-0.1	7.8	311	e 1	55	-2	—	4	32	-63	—	5.3	6.1
Zi-ka-wei	-0.7	22.3	347	e 4	50	-10	—	e 9	2	+5	—	—	—
Batavia	-0.8	25.5	233	e 5	2	-33	—	10	15	+18	—	—	10.9
Osaka	-0.8	26.4	16	7	0	-76	—	—	—	—	—	12.0	16.0
Riverview	-1.5	49.0	153	—	—	—	—	—	—	—	—	e 33.7	—
Ekaterinburg	-2.0	69.3	329	i 10	44	-16	—	i 19	56	+2	—	33.0	38.9
Helwan	-2.1	90.2	300	23	0	? S	—	24	0	+7	—	—	—
De Bilt	-2.2	101.0	328	—	—	—	—	—	—	—	—	e 62.0	—

Additional records : Manila gives MN = +6.3m., T₀ = 15h.1m.41s., Epicentre same as at 7h., 6° 5' N. 127° 0' E., Osaka gives MN = +15.9m., Helwan, the two records are PE and PN respectively. De Bilt gives eLN = +59.0m.

Mar. 16d. Records also at 0h. (Lick), 2h. (La Paz and San Fernando), 9h. (Algiers), 14h. (La Paz), 19h. (Algiers and Rocca di Papa), 20h. (Pola), 22h. (San Fernando).

Mar. 17d. Records at 3h. (Manila (2) and Taihoku), 4h. (Cape Town), 5h. (Batavia), 8h. (Ottawa and Toronto), 9h. (Ekaterinburg), 11h. (Algiers, De Bilt, and Helwan), 22h. (Lick and San Fernando).

Mar. 18d. Records at 1h. (Algiers), 6h. (Rocca di Papa), 7h. (Zi-ka-wei), 14h. (Manila).

Mar. 19d. Records at 1h. (San Fernando), 2h. (Toronto, Helwan, and Colombo), 5h. (Helwan), 7h. (Rocca di Papa), 8h. (Helwan and Ekaterinburg), 11h. (Ekaterinburg, Honolulu, Mizusawa, and De Bilt), 12h. (La Paz), 14h. (Athens), 18h. (Monte Cassino), 21h. and 22h. (Athens).

Mar. 20d. Records at 2h. (De Bilt, San Fernando, and Ekaterinburg), 5h. (La Paz (2)), 10h. (Bidston), 18h. (La Paz), 19h. (San Fernando), 21h. (Ekaterinburg).

Mar. 21d. 1h. 2m. 15s. Epicentre $13^{\circ}0'N$, $123^{\circ}0'E$. (as on 1917 May 28d.).
 $A = -.531$, $B = +.817$, $C = +.225$; $D = +.839$, $E = +.545$;
 $G = -.123$, $H = +.189$, $K = -.974$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Manila	2.6	309	i 0 47	+ 6	—	—	—	—
Taihoku	12.1	354	3 15	+15	5 46	+25	8.1	8.7
Zi-ka-wei	18.2	356	e 4 24	+ 5	8 14	+30	—	12.5
Kobe	24.3	25	5 34	+ 3	—	—	10.0	10.9
Osaka	24.4	26	5 46	+14	—	—	10.2	10.6
Batavia	25.1	221	5 44	+ 5	12 10	?L	(12.2)	12.4
Tokyo	27.2	31	6 16	+16	10 23	-22	—	15.9
Calcutta	34.3	291	7 3	- 4	—	—	—	—
Colombo	43.0	269	6 45	-93	20 45	?L	25.2	27.4
Simla	45.8	302	e 14 33	?S	(14 33)	-52	—	—
Bombay	48.5	283	9 0	+ 3	—	—	—	32.4
Riverview	54.0	151	—	—	e 17 57	+48	(22.0)	28.4
Ekaterinburg	64.2	329	i 10 44	+ 5	i 19 16	+ 1	30.8	34.8
Honolulu	75.1	72	e 36 45	?L	—	—	41.8	47.2
Helwan	85.0	300	12 51	+ 3	—	—	—	58.6
Vienna	91.0	322	—	—	—	—	e 53.8	60.2
Hamburg	92.6	329	e 17 3	?PR ₁	—	—	e 48.8	57.8
De Bilt	95.9	328	—	—	24 56	-19	e 50.8	60.5
Strasbourg	96.1	322	—	—	—	—	e 50.1	—
Uccle	96.9	327	13 45	- 9	—	—	e 51.8	53.8
Edinburgh	97.8	333	25 45	?S	(25 45)	+11	—	55.2
Moncalieri	97.8	320	e 17 54	?PR ₁	34 43	?PR ₁	54.0	—
Eskdalemuir	98.2	334	—	—	—	—	47.8	—
Kew	99.0	330	—	—	—	—	—	62.8
Paris	99.0	326	—	—	e 35 14	?PR ₁	52.8	66.8
Shide	100.0	328	—	—	—	—	—	64.0
Coimbra	110.3	322	56 2	?L	60 3	?	66.3	—
Rio Tinto	110.7	319	45 45	?L	—	—	(45.8)	80.8
San Fernando	111.2	318	61 45	?L	—	—	(61.8)	75.2
La Paz	168.7	109	20 11	[- 3]	—	—	—	—

Additional records: Osaka gives MN = +11.0m. Calcutta PE = +6m.51s.
 Colombo gives its records to the nearest minute. Riverview MN =
 -30.6m.: L is given as S. Ekaterinburg gives epicentre $9^{\circ}23'N$.
 115°37'E. Helwan PN = +13m.15s., MN = +60.4m. De Bilt MN =
 +60.6m. Eskdalemuir LE = +55.8m., LN = +63.8m. Paris MN =
 +54.8m. San Fernando MN = +74.2m.

Mar. 21d. 16h. 1m. 56s. Epicentre $8^{\circ}5'S$, $149^{\circ}0'E$. (as on 1917 Oct. 29d.).
 $A = -.848$, $B = -.509$, $C = -.148$; $D = -.515$, $E = -.857$;
 $G = +.127$, $H = -.076$, $K = -.989$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	25.4	176	e 5 38	- 4	e 10 6	- 5	e 12.1	14.7
Sydney	25.4	176	5 52	+10	10 28	+17	12.9	16.3
Adelaide	28.1	198	6 21	+12	11 21	+20	16.0	17.6
Manila	36.2	310	e 7 16	- 8	—	—	—	—
Perth	38.7	228	8 5	+21	14 27	+39	25.3	28.2
Batavia	41.9	270	e 8 18	- 8	—	—	24.1	—
Taihoku	42.9	322	—	—	e 14 40	- 7	—	24.8
Zi-ka-wei	47.7	328	e 8 52	0	e 15 47	- 3	—	—
Honolulu	60.0	59	25 4	?SR ₁	27 4	?	28.3	33.1
Colombo	70.7	280	12 4	-43	—	—	—	—
Mauritius	88.1	250	24 10	?S	(24 10)	+17	48.1	51.1
	88.1	250	35 34	?	—	—	—	47.6
Berkeley	94.1	50	—	—	—	—	e 40.2	—
Victoria	94.8	42	22 43	?	29 36	?	40.9	52.2
Ekaterinburg	96.2	327	13 27	-23	24 45	-33	42.1	51.2
Helwan	118.1	300	21 4	?PR ₁	—	—	—	—
	118.1	300	17 4	-90	—	—	—	—
Chicago	120.3	45	—	—	—	—	e 54.1	—
Hamburg	124.2	331	—	—	e 33 4	?SR ₁	e 62.1	69.1
Toronto	125.2	42	—	—	—	—	e 58.6	71.4
Ottawa	126.8	38	—	—	—	—	e 60.1	—
De Bilt	127.4	333	—	—	—	—	e 57.1	60.4
Ithaca	127.6	41	—	—	—	—	61.0	—

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	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	127.8	340	21 4	?PR ₁	—	—	—	—
Eskdalemuir	128.3	340	—	—	—	—	58.1	—
Strasbourg	128.4	328	—	—	—	—	e 65.1	—
Uccle	128.6	330	—	—	—	—	67.1	79.1
Georgetown	128.8	45	—	—	—	—	e 71.3	—
Washington	128.8	45	—	—	—	—	e 61.1	—
Bidston	129.8	339	21 16	?PR ₁	28 28	-92	—	72.7
Paris	130.9	331	—	—	—	—	65.1	81.1
La Paz	135.5	124	19 12	[-19]	—	—	63.7	65.7
Coimbra	142.5	330	—	—	—	—	e 73.1	—
San Fernando	144.1	325	83 4	?L	—	—	(83.1)	112.1

Additional records: Riverview gives $i = +5m.52s.$, $PS = +10m.39s.$, $T_0 = 16h.1m.57s.$, Adelaide $PR_1 = +7m.45s.$, $SR_1 = +12m.45s.$, Perth $SR_1 = +17m.46s.$, Batavia $S = M = +15m.27s.$, $T_0 = 16h.1m.14s.$, Victoria $LZ = +42.1m.$, MN = +46.6m., Ekaterinburg $i = +17m.25s.$, Epicentre $3^{\circ}19'S.$ $31^{\circ}32'W.$, Chicago $L = +69.1m.$, Toronto $eL = +61.1m.$ and $+80.2m.$, De Bilt MN = +64.9m., Ithaca LN = +59.5m., Georgetown LE = +73.1m., Washington L = +67.1m., Paris MN = +71.1m., San Fernando MN = +95.1m.

Mar. 21d. 17h. 20m. 25s. (1) \dagger Epicentre $8^{\circ}0'N.$ $128^{\circ}0'E.$ (as on 1913 April 18d.).
17h. 30m. 10s. (11) \dagger

A = -610, B = +780, C = +139; D = +788, E = +616;

G = -086, H = +110, K = -990.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
I Manila	9.5	314	e 2 33	+10	—	—	4.0	5.2
II	9.5	314	—	—	e 4 35	+19	—	—
II Taihoku	18.1	341	e 4 43	+25	—	—	9.2	10.6
I Zi-ka-wei	24.0	346	e 5 29	+1	e 9 50	+6	—	—
II	24.0	346	e 5 6	-22	—	—	—	11.4
I Batavia	25.5	237	e 5 23	-20	9 44	-29	—	11.2
I Mizusawa E.	33.3	19	14 35	?L	—	—	(14.6)	—
II Adelaide	44.1	167	—	—	—	—	22.6	25.0
II Riverview	47.2	154	—	—	e 14 29	-75	e 21.6	27.5
II Sydney E.	47.2	154	—	—	18 20	?SR ₁	22.5	29.5
II Kodaikanal	49.9	277	37 2	?L	—	—	(37.0)	—
I Ekaterinburg	71.0	329	e 20 34	?S (e 20 34)	—	4	42.6	52.7
I Honolulu	72.3	70	34 41	?L	37 47	?L	39.6	42.7
I Victoria	96.1	40	44 34	?L	50 57	?L	60.8	75.0
I Vienna	98.0	321	—	—	—	—	52.6	—
II Hamburg	99.4	328	—	—	e 26 50	+60	e 51.8	53.8
II De Bilt	102.7	328	—	—	—	—	e 53.8	55.9
II Strasbourg	103.1	322	—	—	—	—	55.8	—
II Uccle	103.8	327	—	—	—	—	e 55.8	56.8
II Paris	105.9	325	—	—	e 38 50	?	54.8	57.8
II San Fernando	118.3	319	—	—	—	—	—	81.8
II Toronto	122.7	21	—	—	—	—	e 67.6	73.9
II La Paz	162.1	120	19 13	[-56]	33 23	?	77.4	80.1

Additional records: Manila I gives MN = +5.7m., Mizusawa I PN = +14m.41s., Riverview II MN = +32.1m., Ekaterinburg I S = +30m.32s., De Bilt II MN = +61.0m., San Fernando II MN = +76.8m.

Mar. 21d. Records also at 6h. (Manila (2)), 7h. (Manila and Osaka), 8h. (Taihoku), 10h. and 11h. (Rocca di Papa), 12h. (Batavia), 13h. (Manila), 17h. (Rio Tinto), 19h. (Vienna and Manila).

Mar. 22d. 16h. 18m. 46s. Epicentre $18^{\circ}0'S.$ $170^{\circ}1'E.$ (as on 1918 Mar. 24d.).

A = -937, B = +164, C = -309; D = +172, E = +985;

G = +304, H = -053, K = -951.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	23.2	223	e 5 23	+4	e 9 27	-2	e 13.2	15.4
Honolulu	50.2	40	—	—	—	—	e 25.2	30.4
Perth	50.6	243	—	—	—	—	23.2	—
Manila	58.4	301	e 9 35	-26	—	—	—	—
Tokyo	60.9	332	18 59	?S	(18 59)	+24	(24.2)	25.0
Victoria	89.0	38	—	—	—	—	43.9	49.8

Continued on next page.

	Δ °	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Chicago	110.9	51	—	—	27 45	+ 9	e 55.2	—
Ekaterinburg	115.6	325	e 16 18	+55	e 25 33	-162	44.2	58.6
Ottawa	119.6	47	—	—	—	—	e 65.2	—
Harvard	123.1	50	—	—	e 39 5	?SR ₁	45.7	—
Edinburgh	141.8	354	70 15	?L	—	—	(70.2)	—
De Bilt	E. 143.9	342	—	—	—	—	e 58.2	60.6
	N. 143.9	342	—	—	—	—	e 62.2	74.8
Bidston	144.2	353	63 15	?L	—	—	(63.2)	—

Additional records: Riverview gives PS = -9m.51s. Tokyo records S as P and L as S, and gives all its records as 17h. instead of 16h. Harvard gives LN? = +45.9m.

Mar. 22d. Records also at 1h. (Strasbourg), 3h. (San Fernando), 7h. (San Fernando and Ekaterinburg), 8h. (Ekaterinburg, Helwan, and Hamburg), 12h. (Sydney and Riverview), 13h. (Helwan, Manila, and Ekaterinburg), 14h. (De Bilt and Riverview), 16h. (Manila), 18h. (Helwan), 20h. (Vienna), 22h. (Monte Cassino).

Mar. 23d. 22h. 51m. 35s. Epicentre 9° 5'N. 123° 0'E.

A = -537, B = +827, C = +165; D = +839, E = +545;
G = -090, H = +138, K = -986.

	Δ °	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	5.5	339	e 1 27	+ 2	2 33	+ 2	3.4	3.8
Batavia	22.5	226	e 5 10	- 1	—	—	—	—
Colombo	42.7	270	21 25	?L	—	—	(21.4)	—
Ekaterinburg	67.1	328	e 10 40	-19	e 19 34	-17	30.4	67.7
De Bilt	98.8	326	—	—	—	—	e 54.4	55.9

Additional records: Manila gives T₀ = 21h.51m.41s. and an epicentre 11° 7'N. 126° 4'E. Ekaterinburg i = +10m.42s. De Bilt MN = +55.7m.

Mar. 23d. Records also at 1h. (San Fernando), 2h. (Manila and Denver), 14h. (Mizusawa), 19h. (Lick), 21h. (Mizusawa).

Mar. 24d. Records at 4h. (San Fernando), 8h. (Helwan), 20h. (Helwan and Vieques), 21h. (Helwan).

Mar. 25d. Records at 0h. (San Fernando), 2h. (Taihoku), 3h. (Chicago and Ottawa), 9h. (La Paz), 11h. (Helwan), 14h. (Manila and La Paz), 15h. (Helwan), 18h. and 20h. (Paris).

Mar. 26d. 13h. 34m. 50s. Epicentre 30° 6'N. 141° 8'E. (as on 1917 July 10d.).

A = -677, B = -532, C = -509.

Identification very uncertain: for instance, the epicentre 44° 0' 131° 0'E., as used with deep focus on 1918 April 10d., would suit equally well.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	5.4	2 38	?S	(2 38)	+ 10	—	—
Osaka	6.7	1 36	- 6	—	—	2.7	4.1
Mizusawa	E. 8.5	2 18	+ 9	3 53	+ 3	—	—
	N. 8.5	2 16	- 7	3 59	+ 9	—	—

Osaka gives MN = +3.3m. Manila (Δ = 25° 0') gives e = 13h.38m. = +3m.10s.

Mar. 26d. Records also at 0h. (Taihoku), 5h. (Balboa Heights), 6h. (La Paz), 10h. (Taihoku, Ottawa, Toronto, Chicago, Bidston, and La Paz), 19h. (Batavia), 23h. (San Fernando).

Mar. 27d. Records at 4h. (Coimbra), 8h. (Sydney), 9h. (Helwan).

Mar. 28d. 22h. 40m. 18s. Epicentre $37^{\circ}0'N$. $138^{\circ}5'E$.

$$A = -.599, B = +.529, C = +.602.$$

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo		1.6	0 17	- 7	0 39	- 6	—	2.2
Mizusawa	E.	2.9	0 44	- 1	1 24	- 4	—	—
Osaka		3.5	1 3	+ 8	—	—	2.0	2.7
Kobe	N.	3.6	0 57	+ 1	—	—	2.0	2.2

Additional records: Mizusawa gives PN = +40s. Osaka MN = +2.4m.
Kobe MN = +1.8m., earlier than L.

Mar. 28d. Records also at 1h. (San Fernando), 17h. (Helwan), 20h. (Helwan and Mizusawa), 23h. (Tokyo).

Mar. 29d. Records at 0h. (San Fernando), 1h. (Helwan, Batavia, and Manila), 2h. (Manila, La Paz, and De Bilt), 14h. (Rocca di Papa and La Paz), 15h. (Helwan), 18h. (La Paz), 23h. (Rocca di Papa).

Mar. 30d. 10h. 39m. 52s. Epicentre $9^{\circ}0'N$. $141^{\circ}0'E$. (as on 1919 Mar. 1d.).

$$A = -.768, B = +.622, C = +.156; \quad D = +.629, E = +.777; \\ G = -.121, H = +.098, K = -.988.$$

The focal depth of 0.030 of Mar. 1d. is retained in spite of the La Paz residual.

	Corr. for Focus	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila		-1.2	20.4	288	e 4 45	-14	8 30	+24	10.0
Taihoku		-1.6	24.5	313	—	—	9 39	+16	—
Osaka		-1.7	26.2	350	5 17	-16	—	—	9.7
Zi-ka-wei		-1.9	28.8	323	e 5 45	-12	—	—	—
Batavia		-2.4	37.3	247	e 7 14	+ 2	—	—	—
Riverview		-2.7	43.9	168	e 10 17	+132	16 17	+113	26.3
Honolulu		-3.6	59.8	70	—	—	—	—	e 30.1
Helwan	E.	-4.4	102.2	304	60 20	? L.	—	—	(60.3)
Hamburg		-4.5	105.1	332	—	—	—	—	e 56.1
Edinburgh		-4.6	107.9	340	57 38	? L.	—	—	(57.6)
De Bilt	E.	-4.6	108.2	333	—	—	e 43 10	?	e 57.1
Paris	N.	-4.6	108.2	333	—	—	e 43 23	?	—
La Paz		-4.6	111.8	333	—	—	—	—	67.1
		—	150.6	108	19 56	[- 1]	—	—	—

Additional records: Manila gives MN = +10.4m., $T_0 = 10h.39m.56s.$ Osaka MN = +12.8m. Riverview MN = +30.3m. Helwan PN = +62m.8s.

Mar. 30d. Records also at 0h. (Riverview), 4h. (San Fernando), 13h. (Rocca di Papa), 14h. (Bidston).

Mar. 31d. Records at 0h. (Riverview), 3h. and 10h. (Helwan), 12h. (Denver), 13h. (Manila), 18h. (Mizusawa), 19h. (Manila).

TABLE.

De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.
1	15	28	13	51	553	991	438	101	855	1565	710
2	31	55	24	52	560	1004	444	102	860	1575	715
3	47	83	36	53	566	1016	450	103	865	1584	719
4	62	110	48	54	573	1029	456	104	870	1593	723
5	77	137	60	55	579	1041	462	105	874	1602	728
6	92	164	72	56	586	1054	468	106	879	1612	733
7	106	190	84	57	592	1066	474	107	884	1621	737
8	121	217	96	58	599	1079	480	108	888	1630	742
9	136	243	107	59	605	1091	486	109	893	1639	746
10	150	269	119	60	612	1103	491	110	897	1648	751
11	164	294	130	61	619	1116	497	111	902	1657	755
12	179	319	140	62	625	1128	503	112	907	1666	759
13	193	344	151	63	632	1141	509	113	911	1674	763
14	206	368	162	64	638	1153	515	114	916	1682	766
15	219	392	173	65	645	1165	520	115	920	1690	770
16	232	415	183	66	651	1177	526	116	925	1698	773
17	245	438	193	67	658	1190	532	117	929	1706	777
18	257	460	203	68	664	1202	538	118	934	1714	780
19	269	482	213	69	671	1214	543	119	938	1722	784
20	281	503	222	70	677	1226	549	120	942	1729	787
21	293	524	231	71	683	1238	555	121	947	1737	790
22	305	545	240	72	690	1250	560	122	952	1744	792
23	317	565	248	73	696	1262	566	123	957	1752	795
24	328	584	256	74	702	1274	572	124	961	1759	798
25	338	603	265	75	709	1286	577	125	966	1766	800
26	348	622	274	76	715	1297	582	126	970	1773	803
27	358	641	283	77	721	1309	588	127	974	1780	806
28	368	659	291	78	727	1320	593	128	978	1787	809
29	378	677	299	79	733	1332	599	129	983	1794	811
30	388	694	306	80	739	1343	604	130	988	1801	813
31	398	711	313	81	745	1355	610	131	992	1807	815
32	407	728	321	82	750	1366	616	132	996	1814	818
33	416	744	328	83	756	1377	621	133	1001	1821	820
34	425	760	335	84	762	1388	626	134	1005	1827	822
35	433	775	342	85	768	1399	631	135	1009	1833	824
36	442	790	348	86	773	1410	637	136	1014	1840	826
37	450	804	354	87	779	1421	642	137	1018	1846	828
38	458	818	360	88	785	1432	647	138	1023	1852	829
39	466	832	366	89	790	1443	653	139	1027	1858	831
40	475	847	372	90	796	1454	658	140	1031	1864	833
41	483	861	378	91	801	1464	663	141	1035	1869	834
42	491	875	384	92	807	1475	668	142	1039	1875	836
43	498	888	390	93	812	1485	673	143	1043	1881	838
44	506	902	396	94	818	1496	678	144	1047	1886	839
45	513	915	402	95	823	1506	683	145	1051	1892	841
46	520	928	408	96	829	1516	687	146	1055	1897	842
47	527	941	414	97	834	1526	692	147	1059	1902	843
48	534	954	420	98	840	1536	696	148	1063	1907	844
49	540	966	426	99	845	1546	701	149	1067	1912	845
50	547	979	432	100	851	1556	705	150	1071	1917	846

The International Seismological Summary for 1919 (APRIL, MAY, JUNE).

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The practice of retaining an old Epicentre when it gives small residuals has been found increasingly convenient. It is not difficult to estimate the appropriate change where necessary or its effect on the residuals; and meanwhile there is a clear gain in associating earthquakes in the same neighbourhood, even if not from actually the same focus. The economy of calculation is also a consideration, in view of the rapid growth of the work. Many more records become available as we begin to leave the restricted years of the War behind.

Attention may be called to the following cases of "deep focus" (positive) and "high focus" (negative):—

Date.				Epicentre.		Focal Depth.
	d.	h.	m. s.	°	°	
April 17	20	53	5	14·5N.	91·0W.	+·010
April 30	7	16	55	[19·5S.	173·0W.]	—·015
May 3	0	51	55	40·7N.	145·8E.	+·005
May 6	19	40	45	6·0S.	153·0E.	—·030
May 29	10	59	45	31·5N.	100·5E.	—·020
June 1	6	51	13	25·7N.	124·8E.	+·040

In most of these cases a discussion of the evidence is given; for although the assumptions on which these reductions are based have now been before the seismological public for some two years, there have as yet been no independent opinions expressed as to their validity as far as I am aware. Outside criticism would be cordially welcomed.

It seems impossible to allow a message of any kind, however formal, to go out to seismologists without some reference to the great loss our Science has sustained in the death of Professor Omori.

H. H. TURNER.

University Observatory, Oxford,
1924 February 1.

1919 APRIL, MAY, & JUNE.

April 1d. Records at 0h. (Rio Tinto), 1h. (Athens and Taihoku), 4h. (Helwan (2) and San Fernando), 8h. (Osaka, Kobe, and Taihoku), 9h. (Edinburgh), 10h., 11h. (2) and 12h. (Taihoku), 13h. (Helwan), 14h. (Batavia), 20h. (Taihoku and Tokyo), 21h. and 22h. (La Paz).

1919. April 2d. 0h. 34m. 48s. Epicentre 6°0S. 105°0E.

A = -·257, B = +·961, C = -·104; D = +·966, E = +·259;
G = +·027, H = -·101, K = -·994.

It seems probable that there were two shocks; see, for instance, the Manila records and note. The adopted solution is for the shock which reached the distant stations.

Station and Component.	△	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	1·9	96	i 1 11	+42	—	—	—	—
Manila	26·0	38	e 5 42	- 6	(e 9 22)	-60	6·5	6·8
Perth	27·9	160	5 32	-35	—	—	—	—
Colombo	28·2	297	(6 30)	+20	(10 36)	-27	10·6	12·2
Kodaikanal	31·9	301	6 54	+ 8	(11 6)	-61	11·1	20·1
Calcutta	32·8	332	7 12	+17	11 54	-27	—	—
Taihoku	34·9	28	e 8 2	+50	—	—	—	—
Bombay	40·3	310	7 40	-17	—	—	—	21·9
Zi-ka-wei	40·4	22	e 7 43	-15	e 13 48	-25	—	—
Adelaide	42·4	137	6 51	-83	14 22	-18	23·6	26·2
Simla	45·6	327	e 9 12	+35	15 12	-10	23·7	24·2
Melbourne	48·3	137	9 0	+ 4	16 6	+ 8	23·3	31·7
Osaka	49·8	34	9 5	- 1	16 16	0	24·2	33·4
Riverview	51·0	130	e 9 16	+ 3	e 16 29	- 2	e 24·3	30·4
Sydney	51·0	130	9 18	+ 5	16 42	+11	25·9	31·5
Tokyo	52·9	35	18 34	?	18 53	?	—	—
Mizusawa	E. 55·4	34	9 48	+ 6	17 32	+ 6	—	—
	N. 55·4	34	9 49	+ 7	17 29	+ 3	—	—
Helwan	E. 79·0	304	12 36	+23	—	—	—	46·7
	N. 79·0	304	21 48	?S	(21 48)	-24	—	51·7
Capetown	83·8	237	40 18	?L	—	—	(40·3)	52·3
Lemberg	88·7	321	e 13 0	- 9	23 18	-42	—	23·7
Vienna	E. 93·5	320	i 13 34	- 1	i 24 22	-29	e 55·2?	—
Pompeii	94·3	311	13 27	-13	24 17	-42	25·2	—
Monte Cassino	N. 94·8	312	23 17	?S	(23 17)	-107	—	25·0
Pola	95·0	316	e 13 34	- 9	23 56	-70	e 41·2	—
Rocca di Papa	95·7	312	17 30	?PR ₁	25 30	+17	—	—
Hamburg	97·8	324	e 13 42	-17	i 24 11	-83	e 48·2	60·2
Zurich	98·8	317	e 14 12	+ 8	e 24 13	-91	—	—
Strasbourg	99·3	318	—	—	e 24 10	-99	e 54·7	56·2
Moncalieri	99·4	315	13 42	-25	24 17	-93	37·8	—
De Bilt	100·8	322	—	—	i 24 27	-96	e 51·2	64·2
Uccle	101·4	321	e 17 12	?	e 24 24	-105	—	63·2
Paris	102·7	320	—	—	i 24 36	-105	57·2	59·2
Algiers	103·1	307	—	—	—	—	10·2	—
Shide	104·9	321	—	—	i 25 28	-73	—	—
Edinburgh	105·1	326	25 12	?S	(25 12)	-91	—	66·2
Eskdalemuir	105·2	326	24 50	?S	(24 50)	-114	52·2	—
Bidston	105·5	324	27 30	?S	34 30	?SR ₁	—	60·9
San Fernando	110·6	307	33 12	?SR ₁	—	—	—	80·2
Ottawa	140·5	359	22 34	?PR ₁	—	—	e 71·2	—
Chicago	142·5	12	19 47	[+ 3]	—	—	56·2	—
Harvard	143·4	353	e 77 41	?L	—	—	80·7	—
Washington	147·0	1	i 19 50	[- 1]	29 58	-104	—	—
La Paz	156·5	197	20 12	[+ 8]	34 31	?	76·2	79·7

Additional records: Manila gives its S as e of another shock. Calcutta
 SN = +11m.48s. Zi-ka-wei T₀ 0h.34m.50s. Adelaide PR₁ = +11m.12s., eS =
 +9m.56s., SR₁ = +17m.31s. Melbourne SR₁ = +19m.42s. Osaka
 MN = +36·7m., T₀ = 0h.34m.51s. Riverview PR₁ = +11m.12s., eS =
 +16m.48s., PS = +17m.2s., SR₁ = +19m.34s., MN = +32·7m., T₀ =
 0h.35m.0s. Sydney SR₁ = +20m.12s., M = +33·9m. Vienna iPZ =
 +13m.18s., iSN = +24m.31s. De Bilt iE = +26m.49s., MN = +58·7m.
 Eskdalemuir iE = +27m.36s., iE = +55·2m., LN = 61·2m. San Fer-
 nando MN = +69·2m. Chicago L = +65·7m. and +107·2m.

April 2d. Records also at 4h. (Helwan), 19h. (Helwan, De Bilt, and Capetown), 22h. (San Fernando), 23h. (Berkeley).

April 3d. Records at 0h. (La Paz), 1h. (Denver), 5h. (San Fernando), 7h. and 8h. (Helwan), 10h. and 11h. (La Paz), 12h. (Taihoku), 13h. (La Paz), 17h. (Manila), 18h. (Rio Tinto and La Paz), 19h. (La Paz), 20h. (San Fernando).

April 4d. Records at 1h. (Athens), 11h. (Tokyo), 13h. (Tokyo, Osaka, and Mizusawa), 15h. (Batavia), 19h. (Mizusawa and San Fernando), 20h. (Hokoto and Taihoku), 23h. (La Paz).

April 5d. 4h. 17m. 55s. Epicentre $37^{\circ}0'N$. $26^{\circ}0'E$. (as on 1917 Aug. 27d.).

$$A = +.718, B = +.350, C = +.602.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Athens	2.0	e 0 29	- 2	1 2	+ 7	e 1.1	1.6
Helwan	8.3	1 5	-61	—	—	(5.1)	—
Moncalieri	15.9	—	—	—	—	7.4	—
De Bilt	21.0	—	—	8 43	- 1	11.9	12.7

Athens gives also $iP = +38s$.

April 5d. Records also at 0h. (Helwan), 1h. (Denver), 3h. (Rocca di Papa), 10h. (La Paz), 12h. (Tortosa), 13h. (Bidston), 15h. (La Paz), 16h. (La Paz and Helwan), 20h. (Helwan and Manila), 23h. (La Paz).

April 6d. Records at 1h. (San Fernando), 2h. (Athens), 5h., 6h., and 8h. (Helwan), 15h. (La Paz), 21h. (Rocca di Papa), 22h. (La Paz), 23h. (San Fernando).

April 7d. Records at 0h. (La Paz), 1h. (La Paz, Tokyo, Mizusawa, and Osaka), 3h. (La Paz and Helwan), 6h. (Helwan), 10h. (Kodaikanal), 15h. (Helwan and San Fernando), 16h. (Batavia).

April 8d. Records at 0h. (Zurich), 3h. (La Paz), 12h. (Zurich), 15h. (Manila), 16h. (Taihoku).

April 9d. Records at 0h. (San Fernando), 2h. (Algiers), 7h. (Helwan), 13h. (Helwan and Tokyo), 15h. (Helwan), 16h. (Osaka), 19h. (Tokyo).

April 10d. Records at 0h. (La Paz), 3h. (Kodaikanal and Batavia), 5h. (San Fernando), 7h. (Riverview), 12h. (La Paz), 15h. (Tokyo), 19h. (Colombo), 21h. (Kingston), 22h. (Melbourne).

April 11d. Records at 2h. and 4h. (San Fernando).

April 12d. Records at 0h. (Manila, Taihoku, and Zi-ka-wei), 1h. (San Fernando), 9h. (Moncalieri), 12h. (Manila), 13h. (Monte Cassino), 18h. (Helwan), 22h. (Rocca di Papa).

April 13d. Records at 0h. (San Fernando), 4h. (Apia), 16h. (Rocca di Papa), 18h. (Rio Tinto).

April 14d. Records at 2h. and 5h. (San Fernando), 12h. (Athens and Mizusawa), 15h. (Manila), 22h. (Lick), 23h. (Lick, Berkeley, and La Paz).

April 15d. 23h. 52m. 43s. Epicentre $37^{\circ}2'N$. $139^{\circ}0'E$. (as on 1919 Feb. 18d.).

$$A = -.601, B = +.522, C = +.605.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tokyo	1.7	0 28	+ 2	0 46	- 2	—	—
Mizusawa	2.5	0 32	- 7	—	—	—	—
Osaka	3.9	1 10	+ 9	(1 48)	+ 1	1.8	2.0
Zi-ka-wei	15.7	e 3 44	- 4	—	—	—	—

Osaka gives $MN = +3.1m$.

April 15d. Records also at 1h. and 2h. (San Fernando), 4h. (Paris), 5h. (Paris and Helwan), 9h. (Apia), 17h. (Harvard), 19h. (Manila), 21h. (San Fernando, Manila, Riverview, and Melbourne), 23h. (Toronto, Lick, and Taihoku).

April 16d. 3h. 13m. 53s. Epicentre $39^{\circ}08'$, $17^{\circ}04'W$.

$$A = +.743, B = -.227, C = -.629; \quad D = -.292, E = -.956; \\ G = -.602, H = +.184, K = -.777.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Capetown	28.8	91	11 31	?S	(11 31)	+18	14.9	17.5
Pilar	N. 38.5	270	21 13	?L	—	—	(21.2)	53.9
Andalgala	E. 42.2	273	22 55	?L	—	—	(22.9)	28.1
	N. 42.2	273	—	—	—	—	25.5	29.4
La Paz	49.7	282	9 5	0	16 15	0	24.0	29.4
San Fernando	76.0	10	—	—	—	—	—	44.1
Kingston	79.7	307	—	—	—	—	66.1	—
Helwan	E. 82.2	42	27 37	?SR ₁	—	—	—	49.5
	N. 82.2	42	25 1	?	—	—	—	51.1
Rocca di Papa	85.2	23	(12 49)	0	—	—	e 15.4	16.4
Moncalieri	86.9	19	e 16 49	?PR ₁	—	—	35.8	—
Paris	89.5	13	—	—	—	—	e 45.1	50.1
De Bilt	93.1	16	—	—	e 24 40	- 6	e 46.1	52.4
Harvard	95.0	325	—	—	—	—	46.0	—
Hamburg	95.5	17	—	—	—	—	e 49.1	54.1
Edinburgh	95.6	9	37 7	?L	—	—	(37.1)	52.6
Ottawa	99.5	324	—	—	—	—	e 46.1	—
Colombo	99.6	90	50 7	?L	—	—	54.1?	57.1
Kodaikanal	99.8	86	—	—	—	—	59.9	62.0
Toronto	E. 100.0	321	49 19	?	—	—	55.9	—
Melbourne	101.4	167	—	—	—	—	e 52.1	57.6
Chicago	E. 103.0	316	—	—	—	—	51.0	—

Additional records: Capetown gives S = +12m.37s. La Paz T₀ = 3h.13m.57s.
 Mauritius ($\Delta = 66^{\circ}0'$) PN = 3h.12m.12s., PE = 3h.9m.0s., ME = 3h.41m.30s.
 De Bilt eSR₁N = +30m.44s., MN = +52.6m. Harvard L = +58.8m. and
 +65.7m. Chicago LE = +59.6m.

April 16d. 16h. 39m. 45s. Epicentre $6^{\circ}5'N$, $128^{\circ}0'E$. (as on 1918 July 15d.).

$$A = -.612, B = +.783, C = +.113; \quad D = +.788, E = +.616; \\ G = -.070, H = +.089, K = -.994.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	10.7	320	e 2 39	- 1	—	—	4.4	4.6
Batavia	24.7	239	e 5 41	+ 6	5 53	?	—	8.2
Zi-ka-wei	25.5	346	e 5 34	- 9	e 9 56	-17	—	—
Osaka	29.0	13	5 17	-61	—	—	—	8.5
Colombo	47.8	274	15 15	?S	(15 15)	-36	—	—
Kodaikanal	50.1	279	34 3	?L	—	—	(34.0)	—
Helwan	E. 92.6	301	24 15	?S	(24 15)	-26	—	—
Hamburg	100.8	329	—	—	—	—	e 51.2	—
Rocca di Papa	104.0	317	—	—	—	—	e 35.2	—
De Bilt	E. 104.0	329	—	—	—	—	e 54.2	56.6
	N. 104.0	329	—	—	—	—	e 52.2	55.9
Edinburgh	105.9	333	54 15	?L	—	—	(54.2)	67.2

Additional records: Manila gives MN = +4.9. Helwan PN = +23m.15s.

April 16d. Records also at 1h. (San Fernando), 3h. (La Paz), 4h. (Victoria and Pilar), 7h. (Barcelona), 8h. (Tokyo), 11h. (Lick), 17h. (Colombo), 18h. (Rio Tinto), 19h. (Taihoku), 22h. and 23h. (San Fernando).

1919. April 17d. 11h. 22m. 2s. Epicentre 30°·2S. 179°·0W.

A = -·864, B = -·015, C = -·503; D = -·018, E = +1·000;

G = +·503, H = +·009, K = -·864.

The Epicentre 29°·0S. 178°·0W. (as on 1917 Nov. 16d.) appears to be too near Apia and too far from Australia, as is indicated by Riverview, Melbourne, and Perth consistently. The Epicentre 30°·2S. 177°·7W. (as on 1918 Aug. 5d.) is equally unsuitable.

Station and Component.	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Apia	17·7	24	i 4 12	- 1	(7 34)	+ 1	7·6	—
Riverview	25·5	254	i 5 41	- 2	i 10 14	+ 1	e 12·1	12·8
Sydney	25·5	254	5 40	- 3	9 52	-21	11·8	14·4
Melbourne	30·6	245	i 6 34	0	11 52	+ 8	15·9	18·0
Adelaide	35·8	252	7 10	-10	12 46	-21	15·3	21·7
Perth	55·0	250	9 39	0	17 21	0	27·4	—
Honolulu	55·4	25	9 46	+ 4	16 22	-64	27·0	32·9
Manila	73·1	300	e 11 40	+ 3	21 28	+25	32·4	33·3
Batavia	73·2	274	11 42	+ 5	21 8	+ 4	32·6	45·1
Osaka	77·8	323	12 0	- 6	21 57	- 1	31·7	40·1
Mizusawa	78·6	330	12 10	- 1	22 9	+ 2	—	—
	78·6	330	12 11	0	22 5	- 2	—	—
Nagasaki	79·4	320	27 30	?SR ₁	—	—	—	—
Taihoku	79·4	309	—	—	e 21 28	-48	—	—
Zi-ka-wei	83·4	313	e 12 32	- 6	e 22 47	-14	35·0	44·2
Ootomari	84·2	336	17 2	?PR ₁	—	—	—	—
Cipolletti	85·6	133	—	—	(22 46)	-40	22·8	23·5
Berkeley	86·2	41	i 12 42	-12	e 23 12	-20	—	—
Pilar	92·8	130	23 34	?S	(23 34)	-69	—	59·8
Victoria	93·0	34	13 34	- 2	22 29	-136	38·8	53·2
Andalgala	93·5	127	24 22	?S	(24 22)	-29	43·6	56·0
La Paz	98·7	116	14 9	+ 5	i 24 25	-78	41·8	46·4
Colombo	103·1	271	18 58	?PR ₁	27 58	+93	64·0	67·0
Mauritius	105·7	234	15 58	+80	26 58	+ 9	50·5	54·0
	105·7	234	14 58	+20	26 58	+ 9	40·0	53·7
Kodaikanal	106·8	273	18 46	?PR ₁	—	—	52·1	70·2
Chicago	110·5	51	19 12	?PR ₁	25 9	-144	50·6	—
Rio de Janeiro	112·1	136	—	—	—	—	53·8	—
Ann Arbor	113·4	52	—	—	29 22	+85	42·9	71·0
	113·4	52	19 40?	?PR ₁	29 28	+91	43·0	71·0
Capetown	113·8	195	26 52	?S	(26 52)	-68	74·4	77·4
Bombay	114·8	279	19 48	?PR ₁	—	—	—	65·5
Toronto	116·8	51	18 40	[- 3]	i 30 4	+100	e 68·3	70·2
Georgetown	117·0	59	19 22	?PR ₁	30 6	+100	56·0	—
Washington	117·0	59	20 8	?PR ₁	25 44	?	29·6	—
Ithaca	118·5	53	e 29 19	?S	35 52	?SR ₁	53·3	—
	118·5	53	e 29 23	?S	36 16	?SR ₁	50·3	—
Ottawa	119·8	50	19 23	?PR ₁	30 10	+82	49·9	—
Harvard	122·3	55	27 17	?S	36 39	?SR ₁	58·6	65·8
Dyce	152·9	4	i 20 5	[+ 5]	27 51	?	43·8	53·9
Helwan	153·8	277	20 46	[+45]	—	—	—	106·8
	153·8	277	20 58	[+57]	—	—	—	111·5
Lemberg	153·8	325	e 20 4	[+ 3]	—	—	e 58·1	101·5
Edinburgh	154·2	5	22 58	?PR ₁	—	—	—	110·0
Eskdalemuir	154·7	6	20 3	[+ 1]	31 2	?	52·0	53·1
Hamburg	155·7	347	i 19 58	[- 5]	—	—	e 72·0	85·0
Bidston	156·6	6	20 16	[+12]	31 58	?	—	85·0
De Bilt	157·9	353	20 4	[- 2]	e 34 41	?	e 75·0	94·5
Oxford	158·4	356	20 7	[+ 1]	25 18	?PR ₁	44·2	—
Vienna	158·5	331	i 20 2	[- 4]	—	—	e 51·1	105·2
Kew	158·7	2	—	—	—	—	—	120·0
Uccle	159·2	354	20 1	[- 6]	e 30 10	?	—	80·0
Shide	159·4	357	19 54	[-13]	—	—	—	102·8
Athens	159·7	298	e 20 2	[- 6]	e 31 5	?	e 46·5	86·8
	159·7	298	e 20 2	[- 6]	e 31 5	?	e 51·2	81·6
Strasbourg	160·9	346	20 4	[- 5]	34 59	?	—	81·7
Paris	161·3	357	e 20 10	[+ 1]	34 37	?	45·0	45·0
Zurich	161·9	343	e 20 6	[- 3]	—	—	—	—
Pola	162·2	329	e 23 8	?PR ₁	—	—	46·4	100·5
Besancon	162·6	349	20 47?	[+37]	—	—	87·0	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	c	o	m. s.	s.	m. s.	s.	m.	m.
Moncalieri	164.3	342	20 11	[0]	34 9	?	48.7	99.4
Pompeii	164.8	318	20 26	[+14]	30 12	?	51.0	93.0
Rocca di Papa	165.1	324	e 20 10	[- 2]	—	—	e 47.5	96.3
Marseilles	166.5	347	e 50 57	?	—	—	—	98.0
Coimbra	167.4	35	20 38	[+25]	30 40	?	46.0	90.4
Barcelona	168.7	356	e 24 58	?PR ₁	41 5	?SR ₁ e	78.4	63.0
Tortosa	169.4	2	20 14	[0]	31 23	?	51.0	107.2
Rio Tinto	170.2	38	21 58	?	—	—	—	114.0
San Fernando	171.3	42	20 40	[+25]	—	—	94.2	111.0
Granada	172.1	28	20 18	[+ 2]	32 43	?	—	—
Algiers	173.2	346	20 25	[+ 9]	30 14	?	47.0	95.0

Additional records: Riverview gives $iPR_1 = +6m.33s.$, $PS = +10m.25s.$, $SR_1 = +11m.45s.$, $MZ = +16.1m.$, $T_0 = 11h.22m.3s.$ Epicentre $30^\circ 08'$, $178^\circ 0'W$. Melbourne $PR_1 = +7m.40s.$ Adelaide $PR_1 = +8m.40s.$, $SR_1 = +14m.20s.$ Perth $PR_1 = +13m.25s.$, $SR_1 = +22m.28s.$ Manila $MN = +34.2m.$ Batavia $M = +21.6m.$, $T_0 = 11h.22m.17s.$ Zi-ka-wei $MN = +43.8m.$, $T_0 = 11h.22m.17s.$ Berkeley $ePEN = +12m.52s.?$ The P given in the table is PZ. $T_0 = 11h.22m.12s.$ Andalgala $MN = +52.8m.$ Colombo gives no seconds. Chicago $L = +28.7m.$ Capetown $S = +34m.58s.$ (?SR₁). Toronto $i = +41m.22s.$, $e = +44m.16s.$, $eL = +109.2m.$ Georgetown $L = +41.4m.$ Ithaca $eE = +25m.16s.$ (?PR₁), $L = +122.0m.$ Harvard $SE = +37m.44s.$, $eL = +50.7m.$, $L = +65.7m.$ Eskdalemuir $PZ = +19m.55s.$, $PR_1 = +23m.37s.$, $T_0 = 11h.28m.36s.$ Hamburg $MN = +79.0m.$ Bidston $PR_1 = +23m.58s.$ De Bilt $eN = +23m.45s.$ and $+27m.53s.$, $MN = +76.1m.$ Vienna $iPE = +20m.3s.$ Uccle $PR_1 = +24m.16s.$ Athens $PR_1N = +23m.58s.$, $PR_1E = +24m.1s.$ Strasbourg $PR_1 = +24m.38s.$, $MN = +83.0m.$ Paris $iPE = +20m.19s.$, $e_1 = +23m.44s.$, $e_2 = +31m.43s.$ Pola $MN = +89.4m.$ Moncalieri $MN = +107.0m.$ Coimbra $PR_1E? = +24m.0s.$, $PR_2E = +25m.8s.$, $MN = +111.2m.$ Barcelona $PR? = +31m.56s.$ San Fernando $MN = +113.5m.$

1919. April 17d. 20h. 53m. 5s. Epicentre $14^\circ 5'N.$ $91^\circ 0'W.$

(as on 1918 Oct. 19d.).

$$A = -.017, B = -.968, C = +.250; \quad D = -1.000, E = +.018; \\ G = -.004, H = -.250, K = -.968.$$

The residuals suggest a very slight depth of focus, say 0.010, but even when this is allowed for it would seem that the epicentre is a little too far from the European stations, and too close to the North American. We retain the old epicentre, but allow for the extra depth of focus.

Station and Component.		Corr. for Focus	Δ	Az.	P.		O-C.		S.		O-C.	L.	M.
					m.	s.	s.	m.	s.	s.	m.	m.	m.
Balboa Hts.	E.	-0.1	12.5	115	3	6	+ 1	5	46	+17	6.8	8.2	
	N.	-0.1	12.5	115	3	7	+ 2	5	29	0	6.4	8.6	
Mobile		-0.2	16.4	9	e 4	5	+ 10	i 7	5	+ 5	7.7	7.8	
Lawrence	E.	-0.5	24.7	352	e 5	25	- 6	i 9	50	0	i 9.8	10.3	
	N.	-0.5	24.8	352	i 5	18	-13	i 9	51	+ 1	i 9.8	10.3	
Vieques	E.	-0.5	24.8	78	5	39	+ 8	10	39	+49	13.6	19.6	
	N.	-0.5	24.8	78	6	12	+41	11	21	+90	13.2	13.7	
Tucson	E.	-0.5	25.4	318	5	43	+ 6	i 10	6	+ 5	13.6	16.8	
	N.	-0.5	25.4	318	5	24	-13	i 10	1	0	13.5	—	
Cheltenham	E.	-0.6	27.3	25	5	53	- 2	10	43	+ 8	16.2	19.3	
	N.	-0.6	27.3	25	5	50	- 5	10	39	+ 4	16.6	19.4	
Georgetown	E.	-0.6	27.3	24	e 5	47	- 8	10	33	- 2	12.4	15.6	
	N.	-0.6	27.3	24	e 5	48	- 7	10	33	- 2	—	19.0	
Washington		-0.6	27.3	24	5	46	- 9	(10	35)	0	10.6	15.7	
Chicago		-0.6	27.4	6	5	45	-11	9	5	-92	11.4	12.5	
Denver		-0.6	28.0	337	—	—	—	(9	55)	-53	9.9	17.9	
Ann Arbor	E.	-0.6	28.5	11	5	55	-12	11	7	+10	—	19.6	
	N.	-0.6	28.5	11	5	43	-24	11	1	+ 4	17.4?	19.5	
Ithaca		-0.7	30.6	21	5	56	-31	11	14	-18	—	19.7	
Toronto		-0.7	30.6	17	6	55	+26	i 12	31	- 5	i 14.6	26.3	
Harvard	E.	-0.8	32.8	28	i 6	38	- 9	11	52	-16	—	20.3	
	N.	-0.8	32.8	28	i 6	37	-10	11	44	-24	i 16.8	19.4	
Ottawa		-0.8	33.5	20	i 6	44	-10	e 12	7	-12	e 15.4	21.9	
Northfield		-0.8	33.6	26	e 5	53	-62	(11	55)	-26	18.5	22.9	
Lick		-0.8	35.4	315	—	—	—	(e 11	55)	-54	e 11.9	22.9	

Continued on next page.

Station and Component.		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	°	m. s.	s.	m. s.	s.	m.	m.
Berkeley	E.	-0.8	36.2	316	e 6 56	-21	e 12 39	-22	e 16.0	23.1
	N.	-0.8	36.2	316	e 6 58	-19	e 12 39	-22	e 16.5	23.1
La Paz		-0.8	38.3	143	i 7 26	-8	i 13 31	0	i 18.0	22.1
Victoria		-0.9	43.1	329	7 51	-21	14 7	-31	23.2	31.6
	Z.	-0.9	43.1	329	7 58	-14	13 38	-60	22.4	30.6
La Quiaca	E.	-0.9	44.2	146	32 19	?	?	?	39.4	44.2
	N.	-0.9	44.2	146	32 13	?	?	?	?	44.4
Andalgala	E.	-1.0	48.4	150	17 19	?SR ₁	?	?	19.9	20.5
Pilar	N.	-1.1	53.0	150	40 43	?	?	?	?	47.2
Sitka	E.	-1.1	54.1	331	e 17 1	?S	(e 17 1)	+5	e 28.4	34.2
	N.	-1.1	54.1	331	e 17 7	?S	(e 17 7)	+11	e 33.2	37.4
Honolulu		-1.2	63.7	287	10 49	-20	19 25	+30	30.4	33.0
Coimbra		-1.3	75.2	52	11 46	+5	21 26	+13	33.3	44.4
Edinburgh		-1.3	76.8	35	11 55	+3	?	?	?	52.2
Eskdalemuir		-1.3	76.8	36	11 53	+1	21 44	+12	38.9	48.9
Bidston		-1.3	77.2	39	?	?	21 55	+19	?	50.9
Dyce	N.	-1.3	77.2	33	?	?	22 12	+36	34.0	42.9
San Fernando		-1.3	77.3	55	12 7	+12	?	?	40.9	55.4
Oxford		-1.3	78.5	40	12 5	+3	22 2	+11	27.4	44.7
Shide		-1.3	78.7	40	12 5	+2	21 59	+6	39.1	49.3
Kew		-1.3	79.2	39	20 55	?S	(20 55)	-64	?	50.9
Granada		-1.3	79.3	55	12 21	+14	22 12	+12	?	?
Paris		-1.3	81.4	42	i 12 21	+1	e 22 19	-5	e 35.9	44.9
Uccle		-1.3	82.2	40	e 12 22	-2	e 22 25	-9	e 38.9	50.9
De Bilt	E.	-1.3	82.3	38	12 27	+2	22 41	+6	e 41.9	52.3
	N.	-1.3	82.3	38	12 27	+2	22 41	+6	e 35.9	54.3
Barcelona		-1.4	82.8	49	?	?	e 22 40	+1	e 39.4	44.4
Besancon		-1.4	84.1	43	12 19	-15	?	?	39.9	?
Algiers		-1.4	84.6	53	e 12 42	+5	23 2	+3	39.9	56.4
Hamburg		-1.4	84.8	37	i 12 38	0	i 23 6	+5	37.9	52.9
Apia		-1.4	84.8	254	?	?	e 22 49	-12	38.3	?
Strasbourg		-1.4	84.9	42	12 39	0	23 1	-2	e 40.3	47.8
Zurich		-1.4	85.7	43	12 42	-2	?	?	e 47.0	?
Moncalieri		-1.4	85.8	45	12 47	+3	i 23 11	-1	29.3	54.6
Florence		-1.4	88.6	45	24 35	?	?	?	44.9	51.9
Pola		-1.4	90.0	42	e 12 55	-13	e 23 35	-24	e 37.5	56.2
Vienna		-1.4	90.4	40	e 13 7	-3	i 24 6	+3	43.9	51.9
Athens		-1.5	99.6	46	?	?	?	?	e 52.2	?
Helwan		-1.5	108.9	51	14 55	+9	(21 55)	?	?	74.0
Cape Town		-1.6	114.0	120	26 19	?S	29 19	+90	?	72.4
Nagasaki		-1.6	118.7	321	e 83 27	?L	?	?	(e 83.5)	?
Riverview		—	120.9	238	e 16 46	+59	e 30 16	+80	55.6	69.7
Sydney	E.	—	120.9	238	19 7	[+12]	?	?	?	?
Zi-ka-wei		—	124.8	326	20 44	?PR ₁	?	?	?	?
Melbourne		—	125.6	234	21 37	?PR ₁	26 37	-173	60.6	66.9
Taihoku		—	129.3	320	?	?	e 29 25	-31	?	?
Adelaide		—	131.1	235	?	?	31 47	+99	?	76.3
Simla		—	133.0	14	e 58 43	?L	?	?	(e 58.7)	79.2
Manila		—	137.1	311	e 19 21	[-13]	?	?	?	66.2
Mauritius		—	149.8	105	17 49	-1	75 7	?L	82.2	84.6
Perth		—	149.9	230	19 52	[-4]	?	?	?	?
Kodaikanal		—	152.8	25	38 55	?SR ₁	?	?	90.4	98.5
Colombo		—	156.8	24	23 55	?PR ₁	97 55	?	108.6	109.6
Batavia		—	160.8	293	20 30	[+21]	e 49 57	?SR ₁	79.6	96.8

Additional records: Mobile gives iSN = +7m.20s., MN = +12.6m., T₀ = 20h.53m.28s., Washington S = +9m.14s., L = +22.9m., T₀ = 20h.54m.33s., Chicago MN = +12.1m., Denver MN = +10.9m., Toronto iL = +18.6m. and +24.6m., T₀ = 20h.52m.54s., Harvard iN = +17m.24s., T₀ = 20h.53m.13s., Ottawa L = +42.9m. and +61.9m., T₀ = 20h.53m.2s., Northfield S? = +8m.19s. The true S is given as the first L. Berkeley ePV = +6m.55s., MZ = +23.6m., T₀ = 20h.52m.49s., La Paz PR₁ = +8m.57s., T₀ = 20h.52m.50s., Victoria L = +18.2m. (?SR₁), T₀ = 20h.53m.0s., Coimbra MN = +43.1m., T₀ = 20h.53m.9s., San Fernando MN = +50.6m., De Bilt PR₁E = +15m.45s., m = +32m.28s., T₀ = 20h.53m.16s., Barcelona gives S as e and S (?SR₁) at +28m.44s., Hamburg PR₁ = 15m.49s., SR₂ = +32m.55s., T₀ = 20h.53m.13s., Apia e = +28m.13s. (?SR₁), Strasbourg SR₁ = +28m.43s., SR₂ = +32m.49s., T₀ = 20h.53m.20s., Moncalieri MN = +49.6m., T₀ = 20h.53m.25s., Pola MN = 56.6m., All the records are given one hour late. Vienna ePE = +13m.55s., Helwan MN = +70.0m., Riverview ePR₁? = +21m.49s., PR₂? = +27m.27s., PS = +31m.15s., eSR₁ = +37m.0s. and +37m.25s., SR₂ = +40m.50s. and +41m.42s., MN = +79.4m., Melbourne L = +32.3m., M = +34.9m., Adelaide PR₁ = +22m.34s., SR₁ = +34m.37s., Manila MN = +70.6m.

April 17d. Records also at 0h. (La Paz), 9h. (Batavia and Manila), 13h. (La Paz, Zi-ka-wei, Taihoku, and Toronto), 16h. (Tortosa), 18h. (Mizusawa), 19h. (Rio Tinto), 22h. (Batavia).

April 18d. 6h. 20m. 12s. Epicentre $46^{\circ}0'N$. $25^{\circ}0'E$. (as on 1916 Jan. 26d.).

$A = +.630$, $B = +.294$, $C = +.719$; $D = +.423$, $E = -.906$;
 $G = +.651$, $H = +.304$, $K = -.695$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Lemberg		3.9	351	e 1 0	- 1	—	—	—	8.2
Vienna	E.	6.3	294	e 2 0	+24	—	—	7.1	9.5
Pola		7.9	266	e — 12	-132	—	—	e 6.5	8.3
Strasbourg	Z.	12.0	289	2 58	- 1	—	—	—	—
Moncalieri		12.1	269	—	—	—	—	9.3	—
Hamburg		12.3	314	3 4	+ 1	—	—	e 10.3	10.9
Uccle		14.5	297	e 3 30	- 3	—	—	e 10.8	—
De Bilt	E.	14.6	303	—	—	e 7 32	+70	e 9.5	14.7
Paris		15.4	288	—	—	—	—	e 11.5	11.8
Helwan		16.8	161	3 48	-14	—	—	—	—
Edinburgh		20.2	310	9 48	?L	—	—	(9.8)	—

Additional records: Vienna gives ePZ = +1m.49s.
 De Bilt eSN = +7m.35s., MN = +12.3m.

Pola MN = +8.0m.

1919. April 18d. 21h. 0m. 57s. Epicentre $19^{\circ}6'N$. $106^{\circ}5'W$.

$A = -.268$, $B = -.903$, $C = +.336$; $D = -.959$, $E = +.284$;
 $G = -.095$, $H = -.322$, $K = -.942$.

Station and Component.	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tuscon E.	13.2	344	—	—	e 6 26	+37	7.6	9.4
N.	13.2	344	3 40	+24	—	—	8.0	10.4
Denver	20.1	4	—	—	7 3	-82	10.0	12.0
Lawrence E.N.	21.7	24	e 5 7	+ 6	9 17	+18	12.3	14.3
Lick	22.1	327	—	—	—	—	e 11.0	—
Berkeley N.	22.8	326	5 9	- 6	—	—	e 12.0	14.3
Chicago	27.3	32	6 3	+ 2	10 43	- 3	13.8	15.0
Ann Arbor E.	29.8	35	—	—	11 9	-22	16.6	17.6
N.	29.8	35	—	—	11 27	- 4	16.5	17.0
	29.8	35	—	—	11 21	-10	16.4	17.0
Victoria	31.8	340	9 29	?	12 26	+21	18.3	22.6
Cheltenham N.	31.9	47	7 42	+56	12 16	+ 9	18.3	19.6
Georgetown E.	31.9	46	e 6 33	-13	12 3	- 4	18.2	19.6
Washington	31.9	46	6 37	- 9	12 1	- 6	15.5	49.0
Toronto	33.0	37	—	—	14 51	?SR ₁	19.8	20.6
Ithaca	34.0	41	e 7 49	+44	e 12 24	-16	18.8	—
Ottawa	36.2	38	7 19	- 5	13 3	-10	e 19.4	—
Northfield	37.3	40	—	—	e 13 28	0	53.0	—
Harvard E.	37.5	43	7 30	- 4	13 31	0	21.8	22.2
N.	37.5	43	—	—	13 24	- 7	19.1	—
Sitka E.	43.0	339	—	—	—	—	e 25.0	27.0
Honolulu	48.1	281	20 51	?	—	—	—	26.2
La Paz	52.2	130	9 21	0	e 16 37	- 9	24.0	28.0
Cipolletti	68.8	147	32 57	?L	—	—	37.0	39.6
Apia	72.4	248	—	—	—	—	e 32.8	—
Eskdalemuir	81.2	34	—	—	i 22 46	+ 9	41.0	—
Bidston	82.0	37	—	—	24 3	+77	—	46.0
Coimbra	83.4	50	e 12 39	+ 1	23 9	+ 8	42.0	—
Oxford	83.7	38	23 5	?S	(23 5)	- 1	—	53.0
Shide	84.1	39	13 26?	+43	23 19	+10	42.4	51.8
Rio Tinto	85.5	51	—	—	22 3	-82	—	59.0
San Fernando	86.4	52	48 3	?L	—	—	(48.0)	55.0
De Bilt	87.1	35	—	—	23 47	+ 5	42.0	48.8
Paris	87.1	39	—	—	e 23 47	+ 5	40.0	46.0
Uccle	87.2	37	—	—	e 23 45	+ 2	e 36.0	—
Hamburg	88.9	31	—	—	e 25 3	+61	40.0	52.0
Barcelona	90.2	45	—	—	e 25 29	+73	e 44.5	56.0
Strasbourg	90.3	39	—	—	e 24 3	-14	e 39.0	—
Moncalieri	92.1	40	e 24 10	?S	(e 24 10)	-26	46.5	—
Florence	94.9	40	(16 3) +140	—	—	—	16.0	37.0
Pola	95.8	38	—	—	e 40 3	?	e 55.0	56.3
Rocca di Papa	96.9	41	—	—	e 23 39	-106	—	26.2
Sydney E.	110.7	241	50 45	?L	—	—	(50.8)	54.2
Riverview	110.8	241	—	—	e 33 38	?SR ₁	e 50.8	63.1
Helwan N.	116.1	40	29 3	?S	(29 3)	+44	—	—
Colombo	152.8	346	94 3	?L	—	—	(94.0)	—

For Notes see next page.

NOTES TO APRIL 18d. 21h. 0m. 57s.

Additional records: Denver MN = +13.0m. These records are given 1hr. late.
 Berkeley ePV = +5m.11s., eLV = +11.9m.?, eLE = +12.1m., ME = +21.4m.,
 T₀ = 21h.0m.21s.?, Cheltenham PE = +7m.57s., LE = +19.4m.
 Georgetown eL = +15.0m., LN = +18.0m., MN = +19.1m. Toronto L =
 +26.2m. Ithaca ePN = +7m.56s., eN = +15m.21s. Ottawa PR₁ =
 +8m.33s., L = +21.0m., T₀ = 21h.1m.2s. Harvard iN = +8m.56s., iE =
 +8m.58s., LN = +20.6m., T₀ = 21h.1m.0s. De Bilt eSR₁ = +29m.37s.,
 MN = +44.1m. Paris MN = +41.0m. Moncalieri S = +31m.7s.
 Riverview PS? = +34m.52s., MN = +67.0m. Helwan PE = +31m.3s.

April 18d. Records also at 1h. (Helwan), 4h. (La Paz), 5h. (Eskdalemuir), 20h. (La Paz), 23h. (La Paz).

April 19d. 2h. 57m. 2s. Epicentre 17° 0'N. 97° 0'W. (as on 1917 Mar. 5d.).

A = -0.117, B = -0.949, C = +0.292; D = -0.992, E = +0.122;
 G = -0.036, H = -0.290, K = -0.956.

This old epicentre appears to be a trifle too far to the east.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tucson	E.	19.8	323	11 35	?L	—	—	(11.6)	—
Chicago		26.1	19	5 49	0	10 32	+ 8	16.5	—
Washington		28.0	34	5 40	-28	11 8	+ 9	—	—
Toronto		30.5	27	—	—	—	—	15.7	—
Ottawa		33.5	29	—	—	12 36	+ 4	22.5	—
Harvard	E.	33.7	35	—	—	19 57	? L	e 22.7	—
Victoria		38.0	331	—	—	—	—	21.7	24.2
La Paz		43.9	141	8 21	- 4	—	—	22.4	28.6
Paris		83.4	41	—	—	—	—	49.0	—
De Bilt	E.	83.9	39	—	—	23 13	+ 5	45.0	—
Helwan	E.	111.7	47	73 58	?L	—	—	(74.0)	—

Additional records: Tucson gives PN = +11m.21s. Georgetown gives
 from 3h.21m.13s. to 3h.25m.0s. Toronto L = +41.3m. Harvard eN =
 +23.0m., LE = +24.8m., and +25.7m., LN = +26.6m., T₀ = 3h.5m.50s.
 De Bilt eSR₁N = +28m.44s., eSR₁E = +28m.53s., eLN = +46.0m. De Bilt
 says the same epicentre as on 18d., but this does not seem to be the case.
 Helwan PN = +75m.58s.

April 19d. Records also at 4h. and 21h. (La Paz).

April 20d. Records at 2h. (Rio Tinto), 6h. (Rocca di Papa, Monte Cassino, and Pompeii), 8h. (La Paz).

1919. April 21d. 11h. 25m. 54s. Epicentre 8° 0'N. 40° 5'W.

A = +0.753, B = -0.643, C = +0.139; D = -0.649, E = -0.760;
 G = +0.106, H = -0.090, K = -0.990.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Vieques	E.	26.3	294	5 41	-10	9 36	-52	11.7	16.8
	N.	26.3	294	5 49	- 2	10 18	-10	—	17.5
La Paz		36.8	229	17 36	+ 8	13 17	- 4	17.6	21.8
Accra		40.1	90	11 6	?	—	—	16.1	31.6
San Fernando		42.3	43	8 6	- 7	14 36	- 3	20.3	31.1
Rio Tinto		42.7	40	7 6	-70	—	—	—	25.1
Coimbra		43.1	37	8 15	- 4	14 32	-17	19.8	20.4
Harvard	E.	43.6	326	8 32	+ 9	15 0	+ 4	e 19.5	—
	N.	43.6	326	8 31	+ 8	14 57	+ 1	e 19.3	—
Georgetown		45.1	319	8 40	+ 6	15 18	+ 2	21.1	—
Washington		45.1	319	8 44	+10	15 20	+ 4	21.9	—
Pilar		45.5	209	19 24	?SR ₁	—	—	25.2	31.4
Ithaca	E.	46.8	322	8 37	- 9	15 27	-11	21.4	—
	N.	46.8	322	8 39	- 7	15 26	-12	21.5	—
Algiers		48.9	48	8 53	- 6	15 51	-14	22.1	31.9
Tortosa		49.1	40	8 57	- 4	15 54	-13	21.3	28.9
Toronto		49.2	321	—	—	—	—	e 33.6	35.2

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Barcelona	50.3	41	e 9 2	- 7	16 12	-11	19.6	28.8
Ann Arbor	51.2	320	—	—	—	—	34.1	—
Marseilles	53.3	40	—	—	i 17 5	+ 5	23.1	31.6
Shide	53.6	29	e 9 32	+ 2	i 17 4	0	23.1	—
Chicago	53.6	318	9 42	+12	17 14	+10	25.6	—
Oxford	54.3	29	9 41	+ 6	17 8	- 5	23.6	26.6
Paris	54.5	35	e 9 38	+ 2	e 17 8	- 7	23.1	30.1
Kew	54.5	29	—	—	—	—	—	31.1
Moncalieri	55.6	40	e 9 40	- 3	i 17 25	- 4	23.6	30.2
Besancon	55.7	38	9 49	+ 5	17 31	+ 1	25.1	—
Eskdalemuir	55.7	26	9 25	-19	17 31	+ 1	26.1	26.3
Edinburgh	56.2	24	16 56	?S	(16 56)	-10	—	28.1
Uccle	56.6	32	9 47	- 3	17 45	+ 4	e 26.1	28.1
Strasbourg	57.3	37	9 57	+ 3	17 46	- 4	25.6	31.2
Zurich	57.3	39	e 9 53	- 1	e 17 54	+ 4	—	—
Dyce	57.5	25	e 10 16	+20	18 8	+15	24.0	—
De Bilt	57.6	32	10 4	+ 8	17 55	+ 1	e 26.1	29.0
Rocca di Papa	57.7	46	9 59	+ 2	e 17 56	+ 1	e 31.7	35.7
Pompeii	58.6	47	10 6	+ 3	18 14	+ 8	27.1	36.1
Pola	59.5	41	e 10 12	+ 3	e 18 12	- 5	e 27.6	37.2
Hamburg	61.1	31	e 10 22	+ 2	i 18 45	+ 8	e 25.1	30.4
Vienna	62.4	40	i 10 27	- 1	e 19 6	+13	29.6	34.6
Athens	61.9	53	e 10 44	0	—	—	31.6	35.7
Lemberg	64.9	53	i 10 54	+10	i 19 27	+ 3	e 34.2	40.9
Capetown	67.7	40	e 11 24	+22	e 20 6	+ 8	e 33.0	38.1
Helwan	69.8	131	20 42	?S	(20 42)	+18	(32.2)	40.7
E.	70.3	61	12 0	+41	—	—	—	45.2
	N.	70.3	61	14 54	?PR ₁	—	—	38.2
Victoria	79.4	319	—	—	—	—	37.1	47.5
E.	100.6	110	25 6	?S	(25 6)	-55	47.4	49.9
	N.	100.6	110	11 48	?	—	—	48.9
Simla	108.8	52	e 51 12	?L	—	—	(e 51.2)	60.5
Bombay	109.1	68	—	—	—	—	—	60.3
Honolulu	112.1	298	—	—	—	—	74.9	79.1
Kodaikanal	115.6	75	55 12	?L	—	—	62.9	99.1
Colombo	118.7	78	45 6	?	64 12	?L	66.8	72.1
Zi-ka-wei	137.2	23	—	—	—	—	e 64.1	81.2
Taihoku	142.6	29	—	—	—	—	e 63.2	—
Perth	147.5	139	38 4	?	—	—	—	—
Batavia	147.6	87	e 20 2	[+10]	—	—	74.3	—
Melbourne	149.8	188	71 12	?L	77 12	?L	84.1	88.1
Manila	150.9	40	21 6	[+69]	—	—	—	—
Riverview	152.0	200	e 50 0	?	e 65 18	?	e 77.6	81.8

Additional records: La Paz gives PR₁ = +9m. 1s., T₀ = 11h.26m.19s. San Fernando MN = +27.1m., T₀ = 11h.25m.48s. Coimbra PE = +8m.11s., PR₁N = +9m.51s., LN = +18.3m., MN = +20.5m., T₀ = 11h.26m.3s. There is also a set of observations with the Milne machine. Harvard iE = +9m.28s., T₀ = 11h.26m.17s. Ithaca e = +11m.41s. Toronto L = +17.8m. Barcelona i = +13m.1s., +17m.49s., and +19m.24s. Ann Arbor gives its record 1h. early. Shide iP = +9m.40s., eS = +16m.34s. Paris iP = +9m.42s., iS = +17m.17s., MN = +27.1m., T₀ = 11h.26m.8s. Moncalieri MN = +32.6m., T₀ = 11h.26m.54s. Strasbourg L = +26.1m., T₀ = 11h.26m.6s. Epicentre 8°.5N. 40°.0W. Dyce SN = +18m.10s. De Bilt MN = +38.7m., T₀ = 11h.26m.11s. Pola MN = +34.6m. Hamburg MN = +34.1m., T₀ = 11h.25m.55s. Vienna ePN = +10m.36s., MZ = +94.1m. Athens PR₁ = +13m.46s., PR₂ = +14m.56s., T₀ = 11h.25m.56s. Lemberg eP = +5m.54s. Honolulu gives L one hour too late. Zi-ka-wei MN = +82.2m. Riverview MN = +91.9m.

April 21d. Records also at 2h. and 6h. (La Paz), 7h. (Bombay), 8h. (Paris, Osaka, and Batavia), 9h. (Bombay, Riverview, and Manila), 10h. (Calcutta and Helwan), 13h. (Manila), 14h. (La Paz), 15h. (Chicago, La Paz, Washington, Harvard, and Ottawa), 16h. (De Bilt), 23h. (Berkeley).

April 22d. 2h. 43m. 38s. Epicentre $1^{\circ}0'N$. $147^{\circ}0'E$.

A = -·839, B = +·545, C = +·017; D = +·545, E = +·839;
G = -·015, H = +·010, K = -1·000.

The Australian stations indicate an epicentre considerably nearer them with a deep focus. The La Paz record, however, indicates normal depth. Were there perhaps two shocks?

	Δ c	Az. o	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	29·1	300	e 6 25	+ 6	10 42	-37	13·0	13·9
Taihoku	34·4	319	12 53	?S	(12 53)	+ 7	—	—
Riverview	35·0	174	e 6 39	-34	e 11 56	-59	e 15·0	21·4
Osaka	35·2	345	7 15	0	—	—	—	15·5
Zi-ka-wei	38·7	325	e 7 42	- 2	e 13 42	- 6	—	—
Melbourne	38·8	183	13 16	?S	(13 16)	-33	20·9	26·2
Batavia	40·7	262	e 8 2	+ 1	—	—	—	11·2
Perth	44·2	219	12 58	?S	(12 58)	-127	22·8	—
Honolulu	57·3	68	17 52	?S	(17 52)	+ 2	26·5	32·9
Victoria	89·1	42	—	—	—	—	41·1	49·9
Mauritius	89·5	250	43 40	?L	—	—	(43·7)	—
Helwan	111·5	304	—	—	29 22	+100	—	—
Hamburg	114·8	334	—	—	—	—	e 64·4	—
Chicago	114·9	42	19 49	?PR ₁	29 31	+82	60·4	—
De Bilt	118·0	335	e 20 23	?PR ₁	—	—	e 60·4	63·0
Edinburgh	118·2	341	30 22	?S	(30 22)	+106	—	—
Eskdalemuir	118·7	341	e 20 25	?PR ₁	i 30 11	+91	59·4	—
Toronto	119·1	37	—	—	—	—	69·8	—
Strasbourg	119·2	330	—	—	—	—	e 61·4	—
Uccle	119·2	334	—	—	—	—	e 61·4	—
Ottawa	120·2	33	—	—	(e 27 22)	-89	e 54·4	—
Bidston	120·2	340	27 34	?S	31 22	?	—	66·7
Kew	120·7	338	—	—	—	—	—	67·4
Paris	121·5	334	—	—	—	—	e 61·4	75·4
La Paz	142·1	119	19 36	[- 7]	—	—	72·5	—

Additional records : Riverview gives iPR₁ = +8m.5s., PS = +12m.31s., MN = +23·2m., MZ = +24·6m., T₀ = 2h.43m.41s. Melbourne S = +18m.16s. (SR₁). Chicago L? = +42·4m., L = +47·4m. De Bilt MN = +62·5m. Toronto L = +41·1m. and +72·9m. Ottawa gives eS as the L of a supposed earlier shock.

April 22d. Records also at 4h. (Manila), 10h. (Tokyo, Osaka, and Kobe), 13h. (Bidston), 17h. (De Bilt and Rocca di Papa), 19h. (Vienna), 21h. (Helwan) 23h. (De Bilt, Rocca di Papa, and Eskdalemuir).

April 23d. 7h. 5m. 10s. Epicentre $19^{\circ}0'S$. $177^{\circ}0'W$. (as on 1918 Oct. 13d.).

A = -·944, B = -·049, C = -·326; D = -·052, E = +·999;
G = +·325, H = +·017, K = -·946.

	Δ c	Az. o	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	7·3	45	1 54	+ 3	—	—	3·6	—
Riverview	31·9	236	e 6 55	+ 9	e 12 6	- 1	e 15·4	16·8
Melbourne	38·5	232	—	—	13 44	- 1	20·8	22·1
Adelaide	42·2	238	9 5	+53	13 35	-63	19·1?	25·0
Honolulu	44·4	26	16 2	?S	(16 2)	+55	18·9	19·6
Perth	60·7	243	—	—	19 6	+34	—	—
Manila	69·7	294	—	—	e 18 50	-92	—	—
Victoria	82·7	33	42 25	?L	—	—	53·3	60·5
La Paz	101·6	112	e 17 42	?	—	—	48·9	71·9
Chicago	102·3	50	e 17 50	?PR ₁	—	—	47·8	—
Colombo	104·7	272	55 50	?L	63 50	?	(55·8)	73·8
Kodaikanal	107·9	275	63 26	?L	—	—	(63·4)	—
Toronto	108·4	49	—	—	—	—	60·3	—
Ottawa	111·0	48	—	—	e 29 50	+133	e 47·8	—
Mauritius	113·5	235	49 2	?	—	—	56·0	64·3
Edinburgh	143·0	6	55 50	?L	—	—	(55·8)	—
Eskdalemuir	143·3	6	—	—	—	—	74·8	—
Hamburg	145·0	352	e 19 44	[- 4]	—	—	e 71·8	—
Bidston	145·3	6	55 2	?	63 50	?L	(63·8)	99·8
De Bilt	146·9	358	19 50	[- 1]	—	—	e 69·8	79·3
Strasbourg	150·2	352	20 10	[+14]	—	—	e 82·8	—
Paris	150·3	1	—	—	—	—	e 73·8	—
Helwan	152·1	298	35 10	?	—	—	—	—
Rocca di Papa	155·9	342	e 21 15	[+72]	—	—	—	27·9
San Fernando	160·8	23	37 50	?	—	—	(50·8)	62·8

For Notes see next page.

NOTES TO APRIL 23d. 7h. 5m. 10s.

Additional records: Apia gives $L = +2.7m$. Riverview $eP = +9m.33s.$, $PS = +12m.25s.$, $SR_1 = 14m.12s.$ and $+14m.42s.$, $MN = +17.7m.$, $MZ = +17.3m.$, $T_0 = 7h.5m.32s.$ Melbourne $PR_1 = +9m.20s.$, $SR_1 = +16m.50s.$ Adelaide $SR_1 = +16m.40s.$? It is added that these observations may be $\pm \frac{1}{2}$ min. in error owing to the time signal having failed. Manila gives its record one hour late. Chicago $L = +56.8m.$, $+78.8m.$, and $87.8m.$ Ottawa $e = +38m.50s.$, $L = +56.8m.$, $LE = +80.8m.$ Mauritius $PN = +46m.38s.$, $MN = +56.4m.$ De Bilt $MN = +70.8m.$ Helwan $PN = +37m.10s.$ San Fernando $MN = +114.8m.$ It is assumed that the figures for the hour in the records for P and M have been interchanged.

April 23d. Records also at 15h. (Taihoku), 16h. (Batavia and Helwan), 23h. (San Fernando).

April 24d. 17h. 10m. 32s. Epicentre $6^\circ 0'S$, $105^\circ 0'E$. (as on 1919 April 2d.).

$$A = -.257, B = +.961, C = -.104; D = +.966, H = +.259; \\ G = +.027, H = -.101, K = -.994.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Batavia	1.9	96	i 0 38	+ 9	i 1 3	+10	—	—
Manila	26.0	38	e 5 50	- 2	—	—	—	—
Perth	27.9	160	—	—	10 54	- 3	—	—
Colombo	28.2	297	11 28	?S	(11 28)	+25	20.5	21.5
Kodaikanal	31.9	301	18 28	?L	—	—	(18.5)	—
Zi-ka-wei	40.4	22	—	—	e 14 3	-10	—	—
Mauritius N.	47.8	248	16 46	?S	(16 46)	+55	22.9	24.7
Melbourne	48.3	137	—	—	(14 58)	-60	15.0	—
Riverview	51.0	130	e 16 1	?S	(e 16 1)	-30	e 27.2	28.6
Helwan	79.0	304	25 28	?SR ₁	—	—	(39.5)	—
Hamburg	97.8	324	—	—	—	—	e 55.5	69.5
De Bilt E.	100.8	322	—	—	—	—	e 59.5	68.2
N.	100.8	322	—	—	—	—	e 57.5	58.3
Paris	102.7	320	—	—	—	—	63.5	—
Edinburgh	105.1	326	56 28	?L	—	—	(56.5)	—
San Fernando	110.6	307	61 28	?L	—	—	(61.5)	—
La Paz	156.5	197	—	—	—	—	86.0	87.0

Additional records: Batavia gives $T_0 = 17h.10m.39s.$ Epicentre $8^\circ 1'S$, $106^\circ 3'E$. Colombo gives its records in minutes only. $S = +16m.28s.$ Riverview $MN = +30.8m.$ Mauritius $PE = +15m.10s.$ Helwan gives its two records as PE and PN respectively.

April 24d. Records also at 1h. (Melbourne), 7h. (Taihoku), 17h. (Batavia and Melbourne), 19h. (Batavia (2)), 20h. (Osaka, Kobe, Nagasaki, and Zi-ka-wei), 21h. (Batavia and De Bilt).

April 25d. Records at 0h. (San Fernando), 1h. (Pola), 2h. (Vienna and Rocca di Papa), 12h. (Zi-ka-wei, Kobe, Osaka, and Nagasaki), 16h. (Batavia (2)), 23h. (Tokyo, Mizusawa, and Osaka).

April 26d. Records at 0h. (Kingston and San Fernando), 2h. (San Fernando), 3h. (Batavia (2)), 4h. (Batavia), 16h. (Tokyo), 17h. (Mizusawa), 18h. (Batavia), 19h. (Mizusawa).

1919. April 27d. 0h. 21m. 55s. Epicentre $13^\circ 0'N$, $123^\circ 0'E$.

(as on 1919 Mar. 21d.).

$$A = -.531, B = +.817, C = +.225; D = +.839, E = +.545; \\ G = -.123, H = +.189, K = -.974.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	2.6	309	i 0 49	+ 8	—	—	—	—
Taihoku	12.1	354	3 9	+ 9	4 56	-25	7.0	10.3
Zi-ka-wei	18.2	356	e 4 30	+11	7 50	+ 6	—	13.6
Nagasaki	20.7	17	e 2 2	?	—	—	—	—
Kobe	24.3	25	5 35	+ 4	(10 6)	+16	10.1	10.6
Osaka	24.4	26	5 33	+ 1	—	—	10.2	11.4
Batavia	25.1	221	e 5 13	-26	9 13	-52	—	11.6
Tokyo	27.2	31	6 32	+32	—	—	—	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta	34.3	291	6 29	-38	—	—	24.4	27.4
Kodalkanal	44.7	271	14 17	?S	(14 17)	-54	26.2	28.5
Simla	45.8	302	15 5	?S	(15 5)	-20	—	29.8
Bombay	48.5	282	8 49	—	8	—	—	32.0
Riverview	54.0	150	e 9 31	-2	e 16 53	-16	e 20.9	30.1
Melbourne	54.8	160	—	—	22 5	?SR ₁	28.8	31.2
Mauritius	72.1	242	24 47	?SR ₁	—	—	—	33.0
Honolulu	75.1	70	—	—	—	—	24.1	54.6
Helwan	85.0	300	14 11	?	—	—	—	59.0
Lemberg	85.7	320	—	—	e 23 5	-22	e 50.3	54.5
Vienna	91.0	321	e 13 5	-16	e 24 5	-19	48.0	—
Hamburg	92.6	327	—	—	e 23 5	-96	e 46.0	51.1
Victoria	95.3	37	—	—	—	—	51.9	56.8
Rocca di Papa	95.9	316	13 5	-43	—	—	48.9	64.1
De Bilt	E. 95.9	328	—	—	e 24 10	-65	e 47.1	53.5
N. 95.9	328	—	—	—	—	—	e 45.1	53.2
Strasbourg	96.1	321	—	—	—	—	e 46.1	57.9
Dyce	96.6	333	—	—	—	—	50.1	—
Uccle	96.9	326	—	—	—	—	e 48.1	53.1
Moncalieri	97.8	320	e 17 1	?PR ₁	32 4	?SR ₁	50.8	63.8
Edinburgh	97.8	333	24 5	?S	(24 5)	-89	—	56.1
Eskdalemuir	98.2	332	23 49	?S	32 11	?SR ₁	44.1	54.2
Paris	99.0	325	—	—	i 24 27	-79	50.1	54.1
Kew	99.0	328	—	—	—	—	—	62.1
Bidston	99.3	330	—	—	39 5	?L	(39.1)	53.5
Oxford	99.5	329	—	—	—	—	49.1	63.1
Shide	100.0	328	—	—	24 26	-90	49.4	62.2
Barcelona	103.0	319	—	—	e 24 2	-142	e 53.6	63.1
Cape Town	109.2	237	63 5	?L	—	—	(63.1)	72.1
Colimbra	110.3	320	24 51	?S	44 55	?	61.0	65.1
Rio Tinto	110.7	318	57 5	?L	—	—	(57.1)	68.1
San Fernando	111.3	316	34 17	?SR ₁	—	—	—	67.1
Chicago	118.4	24	20 12	?PR ₁	36 35	?SR ₁	56.2	—
Ottawa	119.2	12	—	—	30 12	+89	e 64.1	—
Toronto	119.8	17	—	—	e 63 23	?L	e 72.0	79.7
Harvard	E. 123.1	10	—	—	53 52	?L	66.7	—
N. 123.1	10	—	—	—	53 38	?L	68.6	—
Washington	124.8	17	20 58	?PR ₁	—	—	e 73.1	—
La Paz	168.7	109	20 16	[+ 2]	—	—	92.1	110.3

Additional records: Zi-ka-wei gives MN = +12.8m., T₀ = 0h.22m.16s., Kobe MN = +11.2m. Osaka MN = +14.1m. Calcutta PE = +6m.41s. (O-C = -26s.). The Simla record is given on 2sd., but this is assumed to be due to a misprint. Riverview MN = +30.4m., T₀ = 0h.22m.12s. Melbourne PR₁ = +17m.41s. Mauritius PE = +25m.59s. Helwan PN = +20m.11s. (?PR₁), MN = +59.3m. Vienna gives its L one hour too early. Hamburg MN = +48.1m., MZ = +57.1m. Strasbourg MN = +52.9m. Moncalieri MN = +65.7m. Eskdalemuir MN = +63.8m. San Fernando MN = +75.6m. Chicago L = +64.1m. and +76.1m., P and S doubtful. Ottawa L = +70.1m. and +83.1m. Harvard eE = +60m.3s. and +61m.36s., LN = +72.4m., T₀? = 0h.55m.45s. Washington L = +79.1m.

April 27d. 2h. 33m. 35s. Epicentre 25°·0N. 141°·5E.

A = -·709, B = +·564, C = +·423; D = +·622, E = +·783;
G = -·331, H = +·263, K = -·906.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	10.7	352	4 0	?S	(4 0)	-48	—	—
Osaka	11.0	333	2 47	-3	—	—	8.6	12.4
Kobe	11.1	332	2 46	0	—	—	8.6	11.8
Zi-ka-wei	18.7	294	e 4 27	+ 2	e 7 59	+ 4	—	—
Manila	21.9	246	—	—	e 8 55	- 8	—	—
Batavia	45.9	232	—	—	e 15 17	-10	—	15.5

Additional records: Osaka gives MN = +13.1m. Kobe MN = +13.0m.

April 27d. Records also at 0h. (Florence), 1h. (Manila and Batavia), 12h. (Edinburgh and Manila), 20h. (Taihoku and Riverview).

April 28d. 6h. 45m. 45s. Epicentre $14^{\circ}5N$, $91^{\circ}0W$. (as on 1919 Apr. 17d.).

$A = -.017$, $B = -.968$, $C = +.250$; $D = -1.000$, $E = +.018$;
 $G = -.004$, $H = -.250$, $K = -.968$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		m.	s.	m.	s.	m.	s.	m.	m.
Balboa Heights	N.	12.5	115	2 42	-24	4 8	-84	5.4	7.9
Vieques	E.	24.8	78	9 47	?S	(9 47)	-12	13.1	16.0
Cheltenham	N.	27.3	25	6 9	+ 8	—	—	15.2	18.0
Washington		27.3	24	6 7	+ 6	10 45	- 1	13.0	—
Georgetown		27.3	24	e 6 0	- 1	10 40	- 6	e 15.4	—
Chicago		27.4	6	6 10	+ 8	10 49	+ 1	13.6	—
Ann Arbor	E.	28.5	12	8 57?	+164	14 39	+211	16.6	17.0
	N.	28.5	12	—	—	13 27	+139	16.6	20.2
	E.	28.5	12	—	—	13 15	+127	16.5	17.2
	N.	28.5	12	—	—	13 39	+151	17.0	20.2
Ithaca		30.7	23	—	—	e 12 10	+24	16.2	—
Toronto		30.8	17	—	—	14 15	?L	i 18.4	18.8
Northfield		31.0	25	—	—	—	e 14.2	—	—
Harvard	E.	32.8	28	—	—	e 11 39	-42	e 18.0	—
	N.	32.8	28	e 12 10	?S	(e 12 10)	-11	e 18.2	—
Ottawa		33.5	20	e 8 7	?PR ₁	e 12 23	- 9	e 16.2	—
Berkeley		36.2	316	—	—	—	—	e 17.8	—
La Paz		38.3	143	7 38	- 2	13 14	-28	17.4	19.6
Victoria		43.1	329	—	—	—	—	24.7	31.7
Honolulu		63.7	287	—	—	—	—	31.2	36.8
Edinburgh		76.8	35	30 15	?L	—	—	(30.2)	—
Bidston		77.2	38	9 15	?	—	—	—	49.2
Paris		81.4	42	—	—	—	—	e 41.2	42.2
De Bilt	E.	82.5	38	—	—	—	—	e 39.2	48.8
	N.	82.5	38	—	—	—	—	e 42.2	45.9
Hamburg		84.8	37	—	—	—	—	e 40.2	50.2
Strasbourg		84.9	42	—	—	—	—	e 43.2	—
Helwan		108.9	51	60 15	?L	—	—	(60.2)	—

Additional records: Balboa Heights gives PE = +2m.37s., T_0 = 6h.46m.30s.
 Cheltenham PE = +6m.14s. Washington L = +17.8m., T_0 = 6h.46m.2s.
 For Ann Arbor the Bosch-Omori records are given first and the Wiechert afterwards. Ithaca eEN = +13m.8s., LN = +16.8m. Northfield LE = +18.2m. Harvard iN = +12m.30s., SN? = +12m.36s., iN = +13m.31s., LN = +20.4m., and +20.8m., T_0 = 6h.44m.22s. Ottawa L = +26.2m. and +44.2m. La Paz T_0 = 6h.46m.51s. Helwan PN = +57m.15s.

April 28d. Records also at 3h. (Mizusawa), 5h. (Manila (2)), 11h. (Harvard), 15h. (Manila (2)), 17h. (Manila), 19h. (Manila and La Paz), 21h. (La Paz and Algiers), 22h. (Manila).

April 29d. Records at 0h. (San Fernando), 1h. (Strasbourg, De Bilt, and Paris), 2h., 4h., and 6h. (Manila), 7h. (Accra), 8h. (Manila (2)), 10h. (Manila, La Paz, and Helwan), 11h. (Manila), 13h. (Manila (2)), 15h. (Manila), 16h. (Athens).

1919. April 30d. 7h. 16m. 55s. Epicentre $21^{\circ}2S$, $172^{\circ}5W$.

$A = -.924$, $B = -.122$, $C = -.362$; $D = -.130$, $E = +.991$;
 $G = +.359$, $H = +.047$, $K = -.932$.

The epicentre $19^{\circ}5S$, $173^{\circ}0W$, given by Apia was first tried, but found to be too near Japan and China, and too far from Australia. The above departure from it was therefore adopted for use. But some 30 consistent observations of [P] have a mean value +7s., or 10s. greater than the normal (-3s.), indicating a focal height of approximately 0.015. It we exclude Apia and make a new solution from the epicentric stations on this supposition, we find three good groups of stations giving equations for $\delta\Delta$ as below:—

No. Stns.	Locality.	Azimuth.	Equation.	$\delta \Delta$	C_1	O-C ₁	C_2	O-C ₂
4	Australia, etc.	248	$-.93x - .37y = -0.2$	-0.6	+0.4	+0.1	-0.3	
10	Japan, etc.	313	$-.73x + .68y = -2.0$	-1.9	-0.1	-1.6	-0.4	
5	America, etc.	33	$+.54x + .84y = -0.2$	-0.6	+0.4	-1.1	+0.9	

—the solution of which is $x = +1^{\circ}2$, $y = -1^{\circ}4$ represented in the column C_1 . This indicates an epicentre at $19^{\circ}2S$, $173^{\circ}8W$, which is distinctly a return towards that given by Apia. The actual Apia epicentre, $19^{\circ}5S$, $173^{\circ}0W$, would be represented by $x = +0^{\circ}5$, $y = -1^{\circ}7$, and would give the values C_2

Continued on next page.

and the residuals O-C₂. Of these the large positive one is mainly due to the Honolulu P, which has been hitherto retained, but must be late on almost any supposition. If we omit it, the Apia epicentre will fit quite well, with the assumption of high focus, but not without. The solution is, however, printed with epicentre given above to show the necessity of the assumption of high focus (or some equivalent).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Apia		7.4	6	i 1 17	-35	(i 2 17)	-64	i 2.3	2.6
Riverview		34.4	240	e 7 9	+ 1	e 12 48	+ 2	e 16.0	22.4
		34.4	240	i 7 20	+12	i 13 1	+15	—	—
Melbourne		40.2	235	7 59	+ 2	14 11	+ 1	19.9	24.1
Adelaide		44.8	241	9 3	+31	15 33	+21	21.2	27.7
Honolulu		44.8	19	9 5	+33	15 29	+17	18.8	24.6
Tokyo		72.7	321	11 32	- 2	(20 52)	- 6	20.9	56.0
Mizusawa	E.	74.3	324	11 40	- 4	30 0	?SR ₁	—	—
	N.	74.3	324	11 41	- 3	29 45	?SR ₁	—	—
Manila		74.5	292	e 11 47	+ 1	21 22	+ 2	36.5	52.7
Osaka		74.6	319	11 48	+ 2	21 14	- 7	30.2	40.8
Kobe		74.8	320	11 48	0	21 28	+ 4	30.8	42.1
Lick	N.	75.4	39	e 12 1	+10	e 22 4	+34	e 33.6	45.9
Berkeley	E.	75.5	38	e 11 51	- 1	e 21 23	- 9	e 32.8	48.3
	N.	75.5	38	e 11 50	- 2	e 21 28	- 4	e 31.9	48.9
Nagasaki		77.1	315	12 8	+ 6	21 48	- 2	32.1	41.0
Ootomari		78.9	330	12 20	+ 8	(22 7)	- 4	22.1	23.6
Taihoku		79.0	303	12 21	+ 8	(22 2)	-10	22.0	23.1
Batavia		79.1	269	12 19	+ 5	22 39	+26	34.8	56.3
Tucson	N.	79.5	50	12 27	+11	—	—	e 37.3	56.8
Hokoto		79.9	301	e 11 55	-23	(22 9)	-13	22.2	—
Zi-ka-wei		82.2	309	12 30	- 1	22 46	- 2	37.7	47.1
Victoria		82.3	30	12 19	-13	19 42	-187	32.0	46.3
	Z.	82.3	30	12 5	-27	19 5	-224	36.3	43.6
Sitka	E.	84.2	20	e 12 45	+ 2	e 24 16	+66	e 47.3	62.8
	N.	84.2	20	12 42	- 1	e 23 54	+44	e 47.8	62.9
Cipolletti		87.3	131	12 29	-32	(23 23)	-21	23.4	46.0
Denver		87.6	46	22 5	?S	28 35	?SR ₁	40.1	51.1
Andalgala	E.	93.5	122	16 35	?PR ₁	(27 41)	?SR ₁	27.7	57.4
	N.	93.5	122	16 41	?PR ₁	(27 35)	?SR ₁	27.6	58.9
Lawrence	E.	93.9	49	13 22	-15	17 21?	?PR ₁	24.2	58.9
	N.	93.9	49	13 24	-13	—	—	43.2	45.5
Balboa Heights	E.	96.0	84	13 50	+ 1	24 54	-22	45.4	61.1
	N.	96.0	84	13 45	- 4	25 5	-11	40.1	61.6
Mobile		96.0	60	e 18 55	?PR ₁	e 26 47	+91	i 53.1	—
La Quiaca		96.5	116	—	—	—	—	64.8	98.7
La Paz		96.8	110	14 5	+12	i 24 41	-43	42.1	47.0
Chicago		100.3	49	13 57	-15	24 33	-86	42.1	56.1
Ann Arbor	E.	103.2	49	13 17?	-69	—	—	43.5	70.1
	N.	103.2	49	—	—	25 53	-33	43.1	65.1
	E.	103.2	49	14 5?	-21	—	—	42.9	70.1
	N.	103.2	49	—	—	25 59	-27	42.1	69.1
Calcutta	N.	106.0	289	14 53	+14	26 41	-11	33.5?	—
Toronto		106.6	48	e 15 5	+23	e 23 23	?	59.6	62.1
Georgetown	E.	107.2	53	e 14 25	-20	25 25	-98	e 44.7	61.0
	N.	107.2	53	e 14 25	-20	25 28	-95	—	63.4
Washington		107.2	53	14 34	-11	25 25	-98	53.1	—
Cheltenham	E.	107.3	54	18 56	?PR ₁	—	—	54.9	67.8
	N.	107.3	54	18 59	?PR ₁	27 5	+ 1	60.1	65.6
Ithaca		108.4	50	14 29	-21	25 26	-108	44.4	68.0
Colombo		108.8	269	14 5	-47	19 5	?PR ₁	24.1	74.1
Ottawa		109.5	47	e 14 35	-20	e 27 17	- 7	e 44.1	—
Northfield		111.5	49	—	—	e 18 58	?PR ₁	55.1	—
Vieques	E.	111.9	78	19 36	?PR ₁	29 18	+93	55.5	74.4
	N.	111.9	78	18 36	?PR ₁	—	—	57.9	59.5
Kodaikanal		112.2	272	19 59	?PR ₁	(26 5)	-103	26.1	70.0
Harvard	E.	112.3	50	e 14 36	-32	26 1	-107	48.2	61.8
	N.	112.3	50	15 25	+17	25 25	-113	e 45.8	60.5
Rio de Janeiro	E.	113.8	129	19 59	?PR ₁	30 29	+149	56.3	65.9
	N.	113.8	129	—	—	29 59	+119	56.4	64.5
Mauritius	E.	115.7	232	14 35	-49	20 47	?PR ₁	30.1	66.1
	N.	115.7	232	16 5	+41	20 41	? PR ₁	27.8	66.1
Simla		117.7	293	20 29	?PR ₁	30 17	+105	45.2	66.8
Bombay		119.1	280	15 52	+14	30 28	+105	—	64.4
Cape Town		123.9	190	21 11	?PR ₁	34 5	?SR ₁	66.2	73.2
Dyce		143.3	9	19 58	[+12]	33 14	?	42.8	79.6
Edinburgh		144.5	10	19 45	[- 2]	—	—	—	107.8

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	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Bidston	146.8	11	19 17	[-34]	33 23	?	—	73.1
Hamburg	147.6	357	c 19 49	[-3]	—	—	e 73.1	128.4
West Bromwich	147.8	11	19 55	[+2]	—	—	—	—
Lemberg	148.5	339	i 20 6	[+12]	—	—	e 62.1	110.8
Oxford	148.7	11	19 56	[+2]	—	—	e 43.1?	61.1?
De Bilt	149.1	2	20 2	[+8]	—	—	e 77.1	129.9
Kew	149.2	10	20 5	[+11]	—	—	—	116.1
Shide	149.7	11	19 56	[+1]	—	—	81.3	85.6
Uccle	150.3	4	19 57	[+1]	—	—	e 43.1	104.8
Paris	152.1	7	i 20 13	[+14]	e 43 5	?SR ₁	73.1	88.1
Vienna	152.1	347	20 5	[+6]	—	—	e 52.4	104.7
	152.1	347	i 19 57	[-2]	—	—	e 58.1	106.6
Strasbourg	152.7	358	20 3	[+3]	34 11	?	e 63.0	118.4
Zurich	153.8	358	e 20 6	[+5]	—	—	—	—
Besançon	154.0	2	20 12	[+11]	29 0?	?	78.1	—
Milan	155.7	357	20 40	[+37]	21 6	?	80.1	86.8
Pola	155.8	349	20 17	[+14]	e 31 7	?	e 107.1	112.1
Moncalieri	156.2	0	20 9	[+6]	37 46	?	49.4	110.3
Coimbra	156.7	32	20 15	[-11]	32 57	?	61.4	102.6
Helwan	156.9	297	19 53	[-12]	—	—	—	—
Florence	157.2	353	20 46	[+41]	42 5	?SR ₁	45.1	84.1
Marseilles	157.9	4	i 20 21	[+15]	e 26 1	?PR ₁	e 81.1	116.7
Athens	158.2	324	20 8	[+2]	30 59	?	e 44.9	67.8
	158.2	324	—	—	—	—	e 44.0	114.5
Rocca di Papa	159.0	349	e 20 12	[+5]	e 34 49	?	e 50.5	117.8
Monte Cassino	159.1	346	20 21	[+14]	—	—	—	113.1?
Barcelona	159.3	11	20 12	[+5]	33 44	?	45.3	52.5
Rio Tinto	159.5	33	20 5	[-2]	—	—	—	117.1
Tortosa	159.5	15	20 17	[+10]	—	—	54.8	63.4
Pompeii	159.6	344	20 22	[+14]	34 5	?	61.1	117.1
San Fernando	160.7	35	20 29	[+20]	—	—	84.1	92.1
Granada	161.4	29	20 26	[+17]	—	—	—	—
Algiers	164.0	13	20 15	[+4]	—	—	46.1	120.6

Additional records: Riverview gives $i = +7m.29s.$, $PR_1 = +9m.4s.$, $PR_2 = +9m.38s.$, $PS = +13m.22s.$, $SR_1 = +15m.31s.$, $SR_2 = +16m.47s.$, MN and $E = +17.4m.$, $MZ = +20.8m.$, $T_0 = 7h.16m.54s.$ Epicentre $17^\circ.0S.$ $176^\circ.0W.$ Melbourne $PR_1 = +9m.29s.$, $SR_1 = +16m.59s.$ Adelaide $PR_1 = +11m.52s.$, $SR_1 = +17m.31s.$, $SR_2 = +18m.53s.$ or $+19m.13s.$ Tokyo $S = +12m.53s.$ Manila $iE = +13m.23s.$ and $+14m.30s.$, $iN = +14m.31s.$, and many more $i's$, $MN = +42.4m.$, $T_0 = 7h.17m.5s.$ Osaka $MN = +41.9m.$, $T_0 = 7h.17m.16s.$ Kobe $MN = +48.2m.$ Lick $ME = +46.6m.$, $T_0 = 7h.16m.51s.$ Berkeley $MV = +47.7m.$, $T_0 = 7h.17m.12s.$ Ootomari gives S as P and records $S = +17m.38s.$ Taihoku gives $S = 16m.55s.$ ($?PR_1$). Zi-ka-vei $PS = +23m.36s.$, $SR_1N = +31m.27s.$, $SR_1E = +31m.58s.$, $LN = +38.0m.$, $MN = +45.4m.$, $T_0 = 7h.17m.5s.$ Denver $LN = +42.1m.$ Lawrence $LN = +25.1m.$ Mobile $i = +25m.0s.$ La Paz $PR_1E = +17m.56s.$, $PR_1N = +18m.3s.$ and $+20m.12s.$, $MN = +47.0m.$ $T_0 = 7h.18m.20s.$ Ann Arbor records Bosch and Wiechert records entered in this order above. Calcutta $SE = +25m.41s.$ Toronto $e = +13m.53s.$, $+18m.23s.$, and $+20m.5s.$, $iL = +27.7m.$ and $+31.1m.$, and several other $L's$. Georgetown $PR_1 = +18m.58s.$, $T_0 = 7h.18m.16s.$ Washington $L = +44.5m.$ and $+70.1m.$ Cheltenham $SR_1N = +34m.31s.$ Ithaca $PR_1 = +18m.24s.$, $SN = +26m.21s.$ Colombo gives no seconds throughout. $L = +29.1m.$ Ottawa $ePR_1 = +19m.23s.$, $L = +63.1m.$, $T_0 = 7h.16m.30s.$ Northfield $L = +60.1m.$ Vieques $SR_1N = +35m.59s.$, $SR_1E = +35m.33s.$ Harvard $PR_1N = +19m.23s.$, $PR_1E = +19m.34s.$, $PR_2E = +20m.23s.$, $PR_2N = +20m.50s.$, $iN = +27m.19s.$, $iE = +29m.10s.$, $SR_1N = +31m.5s.$, $SR_1E = +30m.5s.$, $SR_2N = +36m.5s.$, $T_0 = 7h.18m.10s.$ Rio de Janeiro $LN = +40.9m.$, $LE = +41.5m.$, $MN = +41.2m.$ Dyce $PE = +20m.6s.$ Bidston $P = +19m.17s.$ Hamburg $iPZ = +19m.58s.$ ($\pm 1s.$) De Bilt $MN = +116.6m.$ Shide $P = +20m.5s.$ Uccle $iP = +20m.9s.$, $MZ = +120.8m.$, $MN = +121.3m.$ Vienna $ME = +117.1m.$ Strasbourg $iP = +45m.39s.$, $MN = +112.6m.$ Pola $MN = +114.1m.$ Moncalieri $MN = +103.6m.$ Coimbra $PR_1 = +27m.17s.$, $LN = +65.8m.$, $MN = +119.9m.$ Helwan $PN = +21m.59s.$ Athens $i = +21m.27s.$, $iN = +21m.34s.$, $iE = +21m.51s.$, and a large number of $M's$. Rocca di Papa $iP = +20m.18s.$, $MN = +110.5m.$ Barcelona $PR_1 = +25m.18s.$, $MN = +112.2m.$ San Fernando $MN = +87.1m.$

April 30d. Records also at 3h. (Ascension), 6h. (Port au Prince), 7h. (Chicago), 8h. (Perth), 9h. (La Quiaea), 10h. (Osaka and Kobe), 11h. (Batavia and Mauritius), 12h. (Manila), 16h. (Paris), 17h. (Toronto), 19h. (La Paz Riverview, and Apia), 20h. and 23h. (Apia).

May 1d. 1h. 20m. 45s. Epicentre $26^{\circ}0'N. 143^{\circ}0'E.$ A = -718, B = +541, C = +438; D = +602, E = +799;
G = -350, H = +264, K = -899.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	10.1	345	—	—	—	—	e 6.4	—
Osaka	10.9	325	2 57	+14	—	—	—	13.2
Zi-ka-wei	19.6	290	e 4 40	+ 4	e 8 13	- 2	—	—
Manila	23.5	245	e 5 22	- 1	(9 23)	-12	9.4	—
Apia	59.3	127	—	—	—	—	47.8	—
De Bilt	93.7	336	—	—	—	—	e 49.2	—
Eskdalemuir	93.7	341	—	—	—	—	40.2	—
Helwan	93.9	306	15 15	+98	—	—	—	—
San Fernando	111.1	334	25 15	?S	(25 15)	-143	—	—

Additional records: Osaka gives MN = +14.4m. De Bilt gives its records one hour early, eLN = +44.2m. Eskdalemuir gives its record one hour wrong. Helwan PN = +18m.15s. (?PR₁).

1919. May 1d. 5h. 5m. 33s. Epicentre $10^{\circ}0'S. 36^{\circ}0'E.$ A = +797, B = +579, C = -174; D = +588, E = -809;
G = -140, H = -102, K = -985.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mauritius E.	23.4	118	18 39	?	—	—	—	22.0
Capetown	28.8	211	8 39	?	11 27	+14	—	17.0
Accra	39.2	292	18 27	?L	—	—	(18.4)	27.4
Kodaikanal	45.9	66	15 27	?S	(15 27)	0	23.6	27.8
Bombay	46.4	51	8 47	+ 4	—	—	—	28.7
Colombo	46.8	70	15 27	?S	(15 27)	-11	24.6	28.4
Rocca di Papa	56.0	340	9 43	- 3	e 17 17	-17	e 30.3	41.2
Algiers	56.1	330	e 8 54	-53	e 17 42	+ 7	30.0	35.3
Florence	58.3	341	—	—	—	—	27.4	35.4
Pola	58.4	344	e 8 49	-72	e 18 17	+13	e 31.5	39.6
Granada	60.0	325	i 10 14	+ 2	18 19	- 4	—	—
Barcelona	60.2	333	e 9 46	-27	—	—	e 15.8	37.9
Moncalieri	60.6	339	e 9 16	-60	—	—	23.2	37.8
Calcutta	60.7	57	17 9	?S	(17 9)	-83	—	—
Vienna N.	60.8	349	e 10 19	+ 1	e 18 50	+17	e 33.6	40.4
San Fernando	61.1	323	—	—	—	—	34.4	37.4
Rio Tinto	62.2	324	11 27	+61	—	—	—	39.4
Besançon	63.2	338	10 52	+19	—	—	34.4	—
Strasbourg	63.7	340	10 34	- 2	19 7	- 2	33.1	—
Coimbra E.	64.9	325	e 10 40	- 4	19 21	- 3	33.7	40.9
N.	64.9	325	e 10 36	- 8	—	—	32.6	40.4
Paris	65.8	338	e 10 51	+ 1	e 19 46	+11	32.4	42.4
Uccle	66.8	341	10 59	+ 2	e 19 45	- 3	e 36.4	42.4
Hamburg	67.4	346	e 10 59	- 1	e 19 54	- 1	e 32.4	49.2
De Bilt	67.5	343	11 1	0	19 58	+ 2	e 34.4	43.4
Shide	68.8	338	11 6	- 4	20 9	- 3	32.9	45.1
Kew	69.0	339	—	—	—	—	—	45.4
Oxford	69.7	339	10 49	-26	20 21	- 1	36.6	43.4
Batavia	70.1	92	e 11 46	-28	—	—	36.8	21.2
Bidston	71.6	339	8 27	?	19 9	-96	—	39.0
Eskdalemuir	73.1	340	11 34	- 3	21 15	+12	47.4	—
Edinburgh	73.5	340	20 57	?S	(20 57)	-11	—	40.4
Manila	87.7	75	e 13 57	+54	—	—	—	—
Taihoku	90.3	66	38 21	?L	—	—	(38.4)	—
Adelaide	94.4	128	—	—	—	—	—	55.4
Cipolletti	94.5	230	—	—	—	—	59.2	60.6
Andalgala E.	96.0	240	—	—	—	—	56.2	62.6
Melbourne	98.5	132	—	—	—	—	53.2	55.4
La Paz	100.5	251	e 14 17	+ 4	25 4	-57	49.0	57.4
Mizusawa	108.0	52	33 30	?SR ₁	—	—	—	—
Ottawa	112.3	315	—	—	—	—	e 53.4	—
Ithaca E.	113.4	311	—	—	e 54 42	?	e 60.9	—
Georgetown E.	114.3	309	—	—	—	—	60.6	—
Washington	114.3	309	—	—	54 7	?L	63.0	—
Toronto	115.2	313	—	—	—	—	e 63.4	70.4
Chicago	121.5	312	—	—	54 7	?	63.4	—
Victoria	137.8	339	—	—	—	—	80.3	84.8
Apia	143.6	130	—	—	(30 27)	?	30.4	—
Berkeley	146.0	328	—	—	—	—	e 71.0	—
Honolulu	162.4	48	—	—	(40 27)	?SR ₁	40.4	105.6

For Notes see next page.

NOTES TO MAY 1d. 5h. 5m. 33s.

Additional records : Mauritius PN = +18m.27s., MN = +21.0m. Colombo
 S = +22m.51s. Algiers gives its P and S as e simply, also e = +26m.48s.,
 S = +28m.12s. Pola MN = +42.1m. Moncalieri MN = +43.1m.
 Vienna ePZ = +10m.18s. Hamburg MN = +49.4m., T₀ = 5h.5m.37s.
 De Bilt MN = +43.0m., T₀ = 5h.5m. 37s. Eskdalemuir L = +36.4m.,
 T₀ = 5h.5m.23s. Andalgalá MN = +61.2m. La Paz MN = +58.4m.
 Ottawa L = +64.4m. and +76.4m. Chicago L = +67.4m.

May 1d. Records also at 0h. (Melbourne), 1h. (Perth), 2h. (Vieques), 3h. (Apia, La Paz, Rocca di Papa, and Tokyo), 4h. (La Paz, Kodaikanal, and Simla), 5h. (Mizusawa), 7h. (Harvard and Dehra Dun), 8h. (La Paz and Apia), 12h. (Taihoku and Batavia), 13h. (Manila), 14h. (Kobe and Osaka), 15h. (Melbourne, Manila, Perth, Apia, and Adelaide), 16h. (Victoria, Apia, and De Bilt), 17h. (Marseilles), 19h. (Granada and Apia), 20h. (Tokyo, Mizusawa, and Osaka), 21h. (Apia, Honolulu, Manila, Perth, Taihoku, Adelaide, and Melbourne), 22h. (Helwan, Mauritius, De Bilt, and Victoria), 23h. (Apia).

1919. May 2d. 2h. 7m. 10s. Epicentre 21°2S. 172°5W.

(as on 1919 April 30d.).

A = -.924, B = -.122, C = -.362; D = -.130, E = +.991;
 G = +.359, H = +.047, K = -.932.

T₀ has been inferred from observations of [P] at the Antipodal Stations. An epicentre at 20°4S, 171°4W. would suit the observations rather better, but the material is scanty.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	W.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	7.4	6	1 20	-32	—	—	2.3	4.0
Melbourne	40.2	235	17 50	?	21 8	?	22.8	35.0
Honolulu	44.8	19	8 2	-30	14 50	-22	18.1	26.8
Adelaide	44.8	241	8 25	-7	14 47	-25	24.2	29.1
Perth	63.9	245	10 47	+10	—	—	—	—
Manila	74.5	292	e 11 43	-3	—	—	—	—
Osaka	74.6	319	11 34	-12	21 20	-1	30.4	40.2
Berkeley	75.5	38	—	—	21 20	-12	—	—
Batavia	79.1	269	e 11 31	-43	22 14	+1	e 44.7	23.7
Victoria	82.3	30	22 27	?S	(22 27)	-22	34.4	43.3
Cipolletti	87.3	131	21 56	?S	(21 56)	-108	43.9	50.9
Andalgalá	E. 93.5	122	—	—	—	—	49.6	52.6
La Paz	E. 96.8	110	—	—	24 37	-47	44.4	49.3
Chicago	100.3	49	14 4	-8	24 30	-89	50.8	—
Ann Arbor	E. 103.2	49	23 50?	?S	(23 50?)	-156	41.8	55.8
	E. 103.2	49	25 50?	?S	(25 50?)	-36	42.8	55.8
Calcutta	E. 106.0	289	14 50	+11	—	—	—	—
Toronto	106.6	48	—	—	i 26 44	-13	47.5	61.5
Washington	107.2	53	—	—	e 50 20	?L	55.3	—
Georgetown	107.2	53	e 29 9	?S	(e 29 9)	+126	e 55.0	—
Ithaca	108.4	50	—	—	—	—	e 54.3	—
Colombo	108.8	269	57 50	?L	—	—	(57.8)	76.8
Ottawa	109.5	47	—	—	e 26 50	-34	52.0	—
Northfield	111.5	49	—	—	—	—	e 59.8	—
Vieques	111.9	78	—	—	—	—	57.3	—
Kodaikanal	112.2	272	60 38	?L	—	—	67.1	70.2
Harvard	N. 112.3	50	e 15 9	0	27 19	-29	e 49.2	60.8
Mauritius	115.7	232	18 20	?PR ₁	(28 8)	-8	57.5	63.0
Simla	117.7	293	e 49 2	?L	—	—	(e 49.0)	—
Capetown	123.9	190	40 38	?	68 2	?L	(68.0)	87.0
Edinburgh	144.5	10	99 50	?L	—	—	(99.8)	140.3
Eskdalemuir	145.0	10	e 20 0	[+12]	i 41 34	?SR ₁	73.3	83.0
Bidston	146.8	11	41 56	?SR ₁	—	—	—	75.0
Hamburg	147.6	357	e 19 48	[-4]	—	—	e 73.8	91.6
De Bilt	E. 149.1	2	19 56	[+2]	e 42 21	?SR ₁	e 72.8	88.4
	N. 149.1	2	19 53	[-1]	e 24 23	?PR ₁	e 75.8	87.5
Kew	149.2	10	—	—	—	—	—	89.8
Shide	149.7	11	—	—	—	—	—	86.1
Uccle	150.3	4	e 19 54	[-2]	—	—	—	86.8

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Paris		152.1	7	—	—	e 42 50	?SR ₁	78.8	86.8
Vienna		152.1	347	e 20 4	[+ 5]	e 34 50	?	—	87.9
Strasbourg	Z.	152.7	358	20 4	[+ 4]	—	—	—	—
Pola		155.8	349	—	—	e 43 50?	?SR ₁	e 83.8?	104.8
Moncalieri		156.2	0	e 34 16	?S	47 7	?SR ₁	71.8	91.4
Coimbra		156.7	32	e 20 32	[+ 28]	—	—	42.9	94.6
Helwan	E.	156.9	297	21 44	[+ 99]	—	—	—	114.3
	N.	156.9	297	24 44	?PR ₁	—	—	—	116.5
Florence		157.2	353	33 44	?S	(33 44)	?	—	54.8
Marseilles		157.9	4	—	—	—	—	e 86.1	—
Barcelona		159.3	11	—	—	—	—	e 81.2	88.8
Rio Tinto		159.5	33	25 50	?PR ₁	—	—	—	114.8
San Fernando		160.7	35	84 50	?L	—	—	(84.8)	112.8
Granada		161.4	29	i 20 50	[+ 41]	33 14	?	—	—
Algiers		164.0	13	—	—	—	—	e 83.8	90.8

Additional records : Osaka gives MN = +40.4m. Andagala MN = +53.6m.
 La Paz PR₁ = +18m.17s. Ann Arbor gives Bosch-Omori and Wiechert
 readings. Toronto eL = +55.5m. Georgetown eLZ = +54.7m.
 Ottawa e = +24m.50s. and many other L's. Harvard iN = +29m.14s.,
 LN = 51.7m. Mauritius S is given as PN. Hamburg MN = +89.3m.,
 MZ = +90.9m. Vienna iPZ = +20m.1s. Pola MN = +91.3m.
 Moncalieri MN = +90.2m. Coimbra MN = +87.9m. San Fernando
 MN = +90.3m. Granada SR₁ = +44m.30s.

May 2d. Records also at 0h. (Batavia and Apia), 4h. (Colombo and Apia), 5h. (Chicago, Vienna, and Zi-ka-wei), 6h. (Ottawa, Apia, and Strasbourg), 7h. (Helwan, Taihoku, and Victoria), 9h. (Apia), 18h. (La Paz), 19h. (Ascension), 21h. (Helwan and Chicago), 22h. and 23h. (Lick).

1919. May 3d. 0h. 51m. 55s. Epicentre 40°7'N. 145°8'E.

A = -.627, B = +.426, C = +.652 ; D = +.562, E = +.827 ;
 G = -.539, H = +.367, K = -.758.

The records of this earthquake give a very good determination on the assumption of a very slight depth of focus. As the evidence is plentiful it seems justifiable to go to rather greater refinements than usual, and in the following we have assumed for the depth of focus 0.005, which appears by no means too small to bring the observations in different azimuths into line.

Station and Component.	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	F.	0.0	3.9	247	1 1	0	—	—	—
Ootomari		0.0	6.4	341	1 34	- 4	—	2.0	3.3
Tokyo		0.0	6.9	226	1 45	0	3 10	+ 3	—
Osaka		-0.1	10.2	237	2 33	+ 2	—	—	5.5
Kobe	N.	-0.1	10.3	238	2 35	+ 2	—	—	6.1
Nagasaki		-0.1	15.0	243	3 37	- 1	—	—	4.9
Zi-ka-wei		-0.2	21.8	252	e 4 59	- 1	e 8 53	- 4	6.8
Taihoku		-0.3	25.6	240	5 44	+ 3	(10 22)	+ 13	10.9
Manila		-0.4	33.9	227	e 6 45	- 16	12 5	- 27	14.5
Honolulu		-0.5	50.9	94	9 11	+ 2	(16 17)	- 7	10.4
Calcutta	E.	-0.5	51.2	269	9 5	- 6	16 35	+ 8	15.7
	N.	-0.5	51.2	269	9 5	- 6	16 29	+ 2	16.3
Sitka	E.	-0.5	51.2	43	9 13	+ 2	e 16 35	+ 8	29.1
	N.	-0.5	51.2	43	—	—	e 16 40	+ 13	e 29.1
Dehra Dun		-0.5	54.8	281	9 35	0	—	—	e 29.1
Batavia		-0.6	59.0	227	10 5	+ 4	18 12	+ 8	e 32.5
Victoria		-0.6	61.3	49	10 0	- 17	18 56	+ 24	—
Bombay		-0.6	65.1	275	10 59	- 17	—	—	32.8
Apia		-0.6	67.2	133	—	—	e 19 53	+ 8	42.4
Colombo		-0.6	67.4	260	11 5	+ 8	22 5	?	28.4
Berkeley	E.	-0.6	67.6	58	e 11 5	+ 7	e 20 7	+ 17	44.1
	N.	-0.6	67.6	58	e 11 3	+ 5	e 19 59	+ 9	32.5
	Z.	-0.6	67.6	58	e 11 7	+ 9	—	—	e 30.8
Lick		-0.6	68.4	58	—	—	e 20 43	+ 43	—
Sydney	E.	-0.6	74.7	175	20 5	?S	(20 5)	- 70	35.8
Adelaide		-0.7	75.9	186	10 5	- 105	21 10	- 18	35.6

Continued on next page.

Station and Component.	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Lemberg	-0.7	76.1	325	i 12	0	+ 9	i 21 41	+11	e 40.9 50.6
Denver	-0.7	77.1	49	—	—	—	—	—	39.1 —
Perth	-0.7	77.7	205	12	16	+15	—	—	—
Hamburg	-0.7	78.4	335	i 12	9	+ 4	i 22 6	+ 9	e 38.1 45.1
Tucson	-0.7	78.4	57	—	—	—	22 20	-23	—
Dyce	-0.7	78.5	344	12	20	+14	22 14	+16	47.5 55.1
	-0.7	78.5	344	12	18	+12	22 16	+18	34.1 47.5
Melbourne	-0.7	78.5	181	—	—	—	22 5	+ 7	37.7 42.8
Edinburgh	-0.7	79.9	343	12	5	- 9	—	—	48.2 —
Eskdalemuir	-0.7	80.4	343	12	19	+ 2	22 8	+ 8	39.1 51.6
Vienna	-0.7	80.5	329	i 12	20	+ 2	i 22 31	+10	41.4 51.6
De Bilt	-0.7	81.1	337	12	26	+ 5	22 35	+ 7	38.1 44.8
Bidston	-0.7	82.1	342	12	28	+ 1	i 22 43	+ 4	—
Uccle	-0.7	82.5	337	12	31	- 2	e 22 45	+ 1	40.1 45.2
West Bromwich	-0.7	82.7	341	12	31	- 1	e 22 42	- 4	—
Kew	-0.7	83.2	340	—	—	—	—	—	53.1 —
Oxford	-0.7	83.2	340	12	35	+ 2	i 22 57	+ 5	—
Strasbourg	-0.7	83.4	333	12	37	+ 3	22 51	- 3	39.0 47.2
Zurich	-0.7	84.1	331	12	39	+ 1	23 3	+ 2	—
Pola	-0.7	84.2	329	e 12	39	0	e 23 1	- 2	e 39.1 53.5
Shide	-0.7	84.2	340	12	39	0	i 23 1	- 2	39.4 50.4
Chicago	-0.7	84.4	37	i 12	40	0	23 5	- 1	39.8 —
Paris	-0.7	84.8	338	i 12	45	+ 2	i 23 8	- 1	40.1 41.1
Besançon	-0.7	85.1	335	12	46	+ 2	23 8	- 4	42.1 —
Athens	-0.7	85.3	319	e 12	45	- 1	23 13	- 2	e 41.2 56.5
	-0.7	85.3	319	—	—	—	—	—	e 40.9 55.4
Milan	-0.7	85.5	331	11	20	-87	13 20	?	23.5 —
Ann Arbor	-0.7	85.7	34	12	47	- 1	23 29	+10	40.4 46.2
	-0.7	85.7	34	12	47	- 1	23 17	- 2	40.1 46.1
	-0.7	85.7	34	12	47	- 1	23 11	- 8	40.1 50.1
Florence	-0.7	86.1	330	13	5	+15	23 5	-18	30.1 46.1
Ottawa	-0.7	86.2	28	i 12	51	0	i 23 25	0	38.6 —
Toronto	-0.7	86.3	30	e 13	23	+32	e 23 59	+33	38.1 56.9
Moncalieri	-0.7	86.5	331	i 12	48	- 4	i 23 21	- 7	29.9 56.5
Helwan	-0.7	87.0	309	12	47	- 8	—	—	68.3 —
	-0.7	87.0	309	12	59	+ 4	—	—	62.5 —
Rocca di Papa	-0.7	87.3	327	12	52	- 5	23 21	-16	e 43.0 49.8
Pompeii	-0.7	87.4	325	e 12	27	-30	23 27	-11	33.1 50.6
Northfield	-0.7	88.4	26	13	2	- 1	23 35	-14	e 45.1 —
Ithaca	-0.7	88.5	30	12	58	- 6	23 14	-36	39.9 —
	-0.7	88.5	30	13	1	- 3	22 54	-56	33.5 —
Marseilles	-0.7	88.8	332	i 13	8	+ 2	23 26	-27	42.1 —
Harvard	-0.7	90.4	26	13	6	- 8	24 5	- 6	48.3 62.1
Georgetown	-0.7	91.3	31	e 13	18	- 1	24 21	+ 1	e 45.3 51.2
	-0.7	91.3	31	e 13	18	- 1	24 18	- 2	e 45.3 —
	-0.7	91.3	31	i 13	0	-10	24 22	+ 2	e 44.1 —
Washington	-0.7	91.3	31	13	15	- 4	24 18	- 2	42.1 —
Barcelona	-0.7	91.5	333	13	14	- 6	23 49	-33	39.9 50.6
Cheltenham	-0.7	91.5	31	13	30	+10	24 24	+ 2	50.1 62.1
	-0.7	91.5	31	13	19	- 1	24 19	- 3	46.9 62.7
Tortosa	-0.7	92.0	335	13	23	- 3	23 57	-37	44.4 54.5
Algiers	-0.7	95.3	330	e 13	29	-12	24 19	-43	46.1 53.1
Coimbra	-0.7	95.8	340	13	0	-44	24 20	-47	43.2 57.1
	-0.7	95.8	340	—	—	—	—	—	45.4 56.6
Rio Tinto	-0.7	97.5	339	15	5	+72	—	—	68.1 —
San Fernando	-0.7	98.7	338	13	53	- 7	24 5	-91	53.1 58.6
Mauritius	-0.7	101.4	255	16	17	+123	—	—	58.2 —
Vieques	-0.8	114.3	32	19	44	? PR ₁	—	—	51.8 62.2
	-0.8	114.3	32	19	53	? PR ₁	29 32	+93	62.6 69.0
Cape Town	—	138.2	262	19	23	[-13]	23 41	? PR ₁	83.4 87.4
La Paz	—	142.0	60	e 19	40	[- 3]	33 44	+149	68.7 80.1
	—	142.0	60	i 19	39	[- 4]	33 27	+132	68.6 71.6
Andalgala	—	150.6	74	23	35	? PR ₁	—	—	78.9 103.2
	—	150.6	74	23	23	? PR ₁	—	—	80.6 90.9
Cipolletti	—	154.0	97	19	5	[-56]	—	—	85.6 —

Additional records: Mizusawa PN = +1m.3s. Zi-ka-wei MN = 14.6m.,
 T₀ = 0h.52m.2s. Manila MN = +15.8m., T₀ = 0h.51m.57s. Dehra Dun
 gives its record 10m. too early. Batavia SR₁ = +22m.0s., T₀ = 0h.51m.56s.
 Colombo only records minutes. Lick MN = +37.4m. Adelaide PR₁ =
 +14m.40s., SR₁ = +30m.40s. Lemberg PR₁ = +14m.53s. Denver
 LE = +43.1m. Hamburg PR₁ = +15m.19s., SR₁ = +27m.16s., MN =
 +45.0m., MZ = +50.8m., T₀ = 0h.52m.5s. Melbourne SR₁ = +27m.17s.
 Eskdalemuir PR₁ = +15m.43s., SR₁ = +27m.35s., T₀ = 0h.52m.1s. De Bilt
 PR₁ = 15m.32s., MN = +45.1m., T₀ = 0h.52m.10s., epicentre 38° 2'N. 137° 7'E.

Notes continued on next page.

Bidston $PR_1 = +15m.40s.$ Uccle $iPR_1 = +15m.45s., SR_1 = +28m.5s., MN = +45.7m., MZ = +54.1m., T_0 = 0h.52m.10s.$ West Bromwich $iS = +22m.53s., SR_1 = +28m.7s.$ Oxford $PR_1 = +15m.52s., SR_1 = +28m.20s.$ Strasbourg $MN = +47.0m., T_0 = 0h.52m.16s.$ Pola $MN = +58.6m.$ Shide $PR_1 = +16m.0s., eS = +22m.49s.$ Chicago $PR_1 = +15m.59s., L = +55.1m. and +71.0m., T_0 = 0h.52m.8s.$ Paris $PR_1 = +16m.3s., SR_1 = +28m.48s., T_0 = 0h.52m.15s.$ Epicentre $40^\circ 0' N. 138^\circ 0' E.$ Athens $PR_1 = +16m.13s., SR_1 = +28m.55s., m = +33m.54s., T_0 = 0h.52m.10s.$ Ottawa, a large number of L 's and $T_0 = 0h.52m.10s.$ Toronto $i = +30m.5s., iL = +48.9m. and +54.6m., T_0 = 0h.52m.36s.$ Moncalieri $MN = +56.0m., T_0 = 0h.52m.8s.$ Northfield $L = +62.1m., T_0 = 0h.52m.22s.$ Ithaca $PR_1 = +16m.17s., T_0 = 0h.52m.55s.$ Harvard $iN = +16m.42s. and +23m.37s., eLN = +42.8m., LN = +46.1m., T_0 = 0h.51m.33s.$ Georgetown $iZ = +16m.51s., PR_1N = +17m.2s., T_0 = 0h.52m.9s.$ Washington $PR_1 = +16m.57s., PR_2 = +18m.45s., T_0 = 0h.52m.3s.$ Barcelona $PR_1 = +16m.53s., PR_2 = +20m.8s., SR_1 = +30m.14s. and +34m.12s., MN = +51.7m., T_0 = 0h.52m.22s.$ Algiers $PR_1 = +17m.28s., MN = +56.1m., T_0 = 0h.52m.31s.$ Coimbra $PR_1 = +17m.28s., iS = +31m.36s., T_0 = 0h.51m.29s.$ San Fernando $PE = +18m.35s. (iPR_1).$ Mauritius $PN = +19m.29s. (iPR_1).$ La Paz $PR_1 = +23m.25s.$ Andalgala $ME = +45.9m. and MN = +52.9m.$

May 3d. Records also at 4h. (Mizusawa and Apia), 5h. (San Fernando), 6h. (Mizusawa), 10h. (Apia), 11h. (Apia and De Bilt), 12h. (Helwan), 14h. (Apia), 21h. and 23h. (Apia).

May 4d. 18h. 30m. 38s. Epicentre $34^\circ 6' N. 140^\circ 7' E.$ (as on 1918 Nov. 10d.).

$A = -637, B = +521, C = +568.$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	1.3	0 17	- 3	0 41	+ 5	—	—
Osaka	4.3	1 3	- 4	—	—	2.2	2.3
Mizusawa N.	4.5	1 12	+ 2	2 7	+ 3	—	—
Taihoku	19.2	3 35	-56	—	—	—	—
Helwan	87.4	43 22	?L	—	—	(43.4)	—

Mizusawa $PN = +2m.4s.$

Taihoku gives its record as on 3d.

May 4d. 22h. 0m. 12s. Epicentre $21^\circ 1' N. 121^\circ 7' E.$ (as on 1918 April 26d.).

$A = -490, B = +794, C = +360.$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku	3.9	1 49	?S	(1 49)	+ 2	e 2.4	—
Manila	6.5	1 37	- 2	(2 54)	- 3	2.9	3.2
Zi-ka-wei	10.1	—	—	—	—	e 5.6	—
De Bilt	88.4	—	—	—	—	e 50.8	51.1
Edinburgh	90.1	48 48	?L	—	—	(48.8)	121.8

Additional records: Manila gives $MN = +3.4m.$

De Bilt $MN = +53.4m.$

May 4d. 22h. 42m. 38s. Epicentre $21^\circ 2' S. 172^\circ 5' W.$ (as on 1919 May 2d.).

$A = -924, B = -122, C = -362; D = -130, E = +991;$

$G = +359, H = +047, K = -932.$

T_0 has been inferred chiefly from the antipodal stations; but the observations at Apia, Melbourne, Honolulu, and Chicago suggest an increase of T_0 to about 43m.0s.; in which case the antipodal stations indicate a deeper focus than on May 2. But the material is poor. The records at Rocca di Papa probably refer to another shock. Manila may be one minute in error.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	7.4	6	2 26	+34	—	—	2.8	—
Sydney E.	34.4	240	22 22	?L	—	—	27.0	29.4
Melbourne	40.2	235	18 22	?	—	—	23.3	24.6
Honolulu	44.8	19	—	—	(15 22)	+10	15.4	28.9
Perth	63.9	245	—	—	—	—	30.7	—
Manila	74.5	292	e 10 50	-56	—	—	—	—
Victoria	82.3	30	—	—	—	—	32.3	45.6
La Paz	96.8	110	—	—	—	—	55.8	58.2

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Chicago	100.3	49	15 30	+78	25 27	-32	42.4	—
Toronto	106.6	48	—	—	—	—	58.8	61.9
Ithaca	108.4	50	—	—	—	—	61.7	—
Harvard	112.3	50	—	—	—	—	59.4	—
Eskdalemuir	145.0	10	—	—	e 41 28	?SR ₁	72.4	—
Hamburg	147.6	357	i 19 44	[-8]	—	e	84.4	—
De Bilt	E. 149.1	2	—	—	c 42 16	?SR ₁	79.4	86.6
	N. 149.1	2	—	—	—	—	76.4	87.3
Strasbourg	152.7	358	20 0	[0]	—	—	—	—
Helwan	156.9	297	38 22	?	—	—	—	—
Rocca di Papa	159.0	349	e 20 22	[+15]	(e 20 34)	[+27]	—	20.9
	159.0	349	e 20 4	[-3]	—	—	89.4	20.9
San Fernando	160.7	35	22 22	?PR ₁	—	—	—	—

Additional records: Chicago gives L = +50.4m., T₀ = 22h.6m.49s. Toronto
eL = +60.4m. Harvard L = +61.9m. Eskdalemuir eN = +54m.57s.

May 4d. Records also at 1h., 2h., and 8h. (Apia), 10h. (Helwan), 11h. (Apia),
12h. (Rocca di Papa), 15h. (Apia), 16h. (Mizusawa), 17h. (Apia).

May 5d. 20h. 27m. 45s. Epicentre 55° 0'N. 35° 0'W. (as on 1917 Mar. 3d.).

A = +.470, B = -.329, C = +.819; D = -.574, E = -.819;
G = +.671, H = -.470, K = -.574.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Eskdalemuir	18.0	76	—	—	7 15	-25	—	—
Shide	20.6	88	—	—	—	—	—	13.8
Kew	20.9	84	—	—	—	—	—	12.2
Coimbra	23.0	119	—	—	—	—	e 11.7	—
De Bilt	23.7	80	5 31	+6	9 37	-1	11.2	14.8
Hamburg	25.8	75	c 5 44	-2	—	—	e 15.0	15.2
San Fernando	27.0	122	15 15	?L	—	—	(15.2)	—

Additional records: De Bilt gives MN = +15.0, T₀ = 20h.28m.8s. Ham-
burg MN = +16.2m., T₀ = 20h.33m.29s. San Fernando PN = +14m.45s.

May 5d. Records also at 0h. (Helwan and Paris), 2h. (Cape Town), 4h. (Rio
Tinto), 5h. (Georgetown), 6h. (De Bilt and Eskdalemuir (2)), 13h.
(Apia and Hamburg), 14h. (Vienna and Strasbourg), 15h. (Colombo and
Helwan), 16h. (Hamburg, Paris, and De Bilt (2)), 17h. (Rocca di Papa
and Vienna), 18h. (La Paz), 19h. (Zi-ka-wei, Helwan, Eskdalemuir,
Moncalieri, and De Bilt), 23h. (Helwan and De Bilt).

May 6d. 4h. 8m. 50s. Epicentre 21° 2'S. 172° 5'W. (as on 1919 May 4d.).

A = -.924, B = -.122, C = -.362; D = -.130, E = +.991;
G = +.359, H = +.047, K = -.932.

The identity of the epicentre is very doubtful.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia	7.4	6	3 0	+68	i 3 10	-11	—	4.6
Melbourne	40.2	235	—	—	14 10	0	24.0	24.7
Honolulu	44.8	19	15 10	?S	(15 10)	-2	19.0	28.2
Adelaide	44.8	241	18 4	?SR ₁	22 54	?L	27.3	29.7
Perth	63.9	245	19 10	?S	(19 10)	-2	—	—
Manila	74.5	292	e 12 20	+34	—	—	—	—
Victoria	82.3	30	—	—	—	—	40.6	45.5
Cipolletti	87.3	131	46 16	?L	—	—	(46.3)	53.6
La Paz	96.8	110	e 33 21	?SR ₁	—	—	48.0	58.7
Chicago	100.3	49	—	—	25 43	-16	46.7	52.2
Toronto	106.6	48	—	—	—	—	56.5	62.1
Colombo	108.8	269	71 10	?L	—	—	(71.2)	—
Edinburgh	144.5	10	42 10	?SR ₁	—	—	—	80.4
Eskdalemuir	145.0	10	—	—	41 10	?SR ₁	—	—
Hamburg	147.6	357	e 20 29	[+37]	—	e	79.2	94.2
De Bilt	E. 149.1	2	—	—	e 43 7	?SR ₁	e 84.2	84.7
	N. 149.1	2	e 20 54	[+60]	—	e	80.2	86.8
Kew	149.2	10	—	—	—	—	—	90.2
Paris	152.1	7	—	—	—	—	e 85.2	—
Vienna	152.1	347	i 20 41	[+42]	23 47	?PR ₁	31.2	—
Strasbourg	152.7	358	—	—	—	—	94.2	—
Helwan	E. 156.9	297	30 10	?S	(30 10)	?	—	—

Additional records: Melbourne gives PR₁ = +9m.22s., SR₂ = +20m.40s.
Chicago L = +52.2m. Toronto eL = +58.5m. Helwan PN =
+43m.10s. (?SR₁).

1919. May 6d. 19h. 40m. 45s. Epicentre 6°0S. 153°0E.

(as on 1918 Aug. 8d.). Focus 0.030 above normal.

A = -·886, B = +·451, C = -·104; D = +·454, E = +·891;

G = +·093, H = -·047, K = -·995.

There seem to be several mistakes of whole minutes. The solution adopted is the outcome of a good deal of work on the material, which pointed persistently to the high focus. It will be seen that the antipodal observations support this view.

	Corr. for Focus	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Sydney	+1.8	27.9	183						17.8
Adelaide	+2.1	31.8	203	6 59	- 5	11 59	-40	16.9	18.9
Melbourne	+2.2	32.7	192	7 15	+ 3	13 51	+57		20.2
Apia	+2.2	35.5	104	7 35	- 1	(13 21)	-13	16.0	20.2
Manila	+2.4	37.9	303	e 7 42	-15	14 3	- 8	17.5	20.7
Perth	-2.7	43.3	228	6 33	-127	15 15	-13		
Taihoku	-2.7	43.5	319	8 46	+ 5	13 42	-109	18.5	20.0
Tokyo	+2.7	43.5	347	8 31	-10	16 24	+53	19.5	23.5
Hokoto	-2.7	44.0	316	e 7 25	-80				
Kobe	-2.7	44.0	339	8 47	+ 2			18.8	22.2
Osaka	-2.7	44.0	339	8 36	- 9	15 23	-14	19.7	19.9
Nagasaki	-2.8	44.5	332	8 31	-18			19.2	23.7
Batavia	-2.8	45.9	268	(4) 48	(-10)	(12) 36	(-26)	18.9	21.3
Mizusawa	-2.9	46.4	349	8 40	-22	19 36	? S R ₁		
Ootomari	+3.3	53.4	354	8 41	-69	15 31	-131	20.5	22.8
Honolulu	+3.4	55.3	59	9 15	-48	i 15 45	-142	24.8	33.2
Calcutta	E. +3.8	69.3	299	11 33	- 4	21 27	+24	30.7	36.5
	N. +3.8	69.3	299	11 21	-16	20 45	-18	30.7	
Colombo	+3.9	74.1	279	12 15	- 8	23 15	-75	37.2	50.2
Dehra Dun	-4.0	80.2	304	11 15	-88				
Simla	-4.0	81.1	303	12 27	-22	22 45	-35	34.6	49.5
Bombay	-4.1	82.8	290	13 23	25				
Sitka	E. -4.1	85.2	31	e 24 11	? S	(24 11)	+ 5	39.8	42.5
	N. -4.1	85.2	31	e 25 40	? S	(25 40)	-94	39.2	42.7
Berkeley	E. -4.2	89.4	52	e 13 19	-17	e 25 1	+ 9		52.8
	N. -4.2	89.4	52	e 13 55	-19	e 25 6	+14	e 36.6	43.5
	Z. -4.2	89.4	52	e 13 23	-13	e 24 56	+ 4		52.8
Lick	-4.2	89.9	52			e 26 7	+70		54.2
Victoria	-4.2	90.3	41	16 6	+145	24 28	-33	38.2	56.9
Tucson	+4.3	98.3	58					40.7	42.6
Denver	+4.4	103.0	50	47 15	?			59.2	60.2
Chicago		115.7	45	18 35	? 5	30 5	?	50.2	
Ann Arbor	E. -	118.3	45	20 33	? PR ₁	30 27	?	50.9	64.2
	N. -	118.3	45	20 21?	? PR ₁			51.2	65.2
	E. -	118.3	45	20 39	? PR ₁			51.0	64.2
	N. -	118.3	45	20 45	? PR ₁			51.2	
Lemberg		118.9	324	20 45	? PR ₁			e 52.4	68.2
Helwan	E. -	120.4	301	53 21	? L			(53.3)	143.6
	N. -	120.4	301	55 21	? L			(55.3)	134.8
Toronto		120.8	42	e 20 39	? PR ₁	31 15	?	39.3	82.1
		120.8	42	21 27	? PR ₁	e 32 3	?	43.4	
Cipolletti		121.2	142	21 51	? PR ₁			63.8	77.4
Cape Town		121.4	223	17 51	[-65]	31 33	?	65.3	72.3
Ottawa		122.4	39	e 20 21	? PR ₁	31 6	?	50.2	
Ithaca		123.2	42	e 21 4	? PR ₁			51.6	

The allowance for high focus has ceased to be applicable except by guess. The remainder of the observations are chiefly interesting at present for the value of [P].

	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Hamburg	123.7	333	e 19 18	[+16]			e 53.2	68.1
Vienna	124.0	326	e 19 23	[+20]	31 17	?	e 50.2	55.2
Athens	124.1	312	e 19 41	[+58]	30 26	?	e 52.4	64.3
Georgetown	E. 124.2	46	e 19 55	[+51]	e 31 41	?	e 52.8	70.2
	N. 124.2	46	e 20 4	[+60]	e 31 48	?	e 53.2	62.9
Washington	124.2	46	e 20 15	? PR ₁	31 45	?	52.7	
Cheltenham	E. 124.4	46	22 0	? PR ₁			55.2	70.6
	N. 124.4	46	23 6	? PR ₁			53.2	68.2
Northfield	124.8	39	e 20 35	? PR ₁	31 20	?	51.2	
Dyce	E. 125.1	344	22 5	? PR ₁			53.1	65.0
	N. 125.1	344	22 5	? PR ₁	31 17	?	39.2	63.1

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	126.6	344	20 15	[+65]	—	—	—	67.2
Harvard	126.7	40	e 20 12	[+62]	31 28	?	e 53.1	62.1
De Bilt	126.9	336	e 15 54	-20	e 28 36	-63	e 54.2	59.1
Eskdalemuir	127.2	343	e 19 50	[+39]	e 32 30	?	—	75.5
Pola	127.4	324	e 20 15	[+63]	e 32 15	?	e 53.7	67.4
Uccle	128.1	335	e 19 15	[+1]	—	—	e 54.2	79.5
Strasbourg	128.3	330	19 33	[+18]	—	—	e 22.3	67.6
Zurich	128.7	329	e 19 27	[+12]	—	—	e 44.2	—
Bidston	128.7	342	21 15	?PR ₁	33 45	?	—	72.2
Pompeii	129.3	319	19 47	[+30]	31 41	?	43.2	65.2
Andalgala	129.3	133	27 3	?	—	—	67.5	78.4
	129.3	133	45 3	?	—	—	67.8	79.0
Kew	129.4	339	22 15	?PR ₁	—	—	—	71.2
Oxford	129.5	339	20 1	[+44]	—	—	—	82.3
Florence	129.5	322	22 24	?PR ₁	39 59	?SR ₁	59.2	64.2
Milan	129.6	327	18 21	[-56]	—	—	63.2	85.5
Rocca di Papa	129.8	322	19 28	[+10]	28 5	?	e 56.0	67.4
Besançon	130.0	331	19 56	[+38]	—	—	54.2	—
Shide	130.4	339	20 0	[-41]	23 15	?PR ₁	43.4	73.1
Paris	130.5	335	19 56	[+37]	—	—	56.2	61.2
Moncalieri	130.7	328	20 14	[-54]	35 59	?	45.3	82.3
La Quiaca	132.8	129	60 21	?L	—	—	(60.3)	66.3
Marseilles	133.1	329	i 23 32	?PR ₁	e 29 9	-73	57.2	78.7
La Paz	133.5	119	20 1	[+35]	33 27	?	56.7	69.2
Barcelona	136.1	328	e 20 2	[+30]	36 18	?	54.2	70.5
Tortosa	137.4	329	19 50	[+15]	—	—	47.4	71.0
Algiers	138.7	323	20 4	[+27]	29 35	-81	61.2	72.2
Vieques	E. 140.6	68	21 13	[+93]	23 59	?PR ₁	59.5	79.3
	N. 140.6	68	21 20	[+100]	—	—	60.0	79.6
Coimbra	141.9	337	20 12	[+29]	31 26	+12	57.0	76.4
	141.9	337	e 22 49	?PR ₁	42 15	?SR ₂	59.2	76.7
Granada	142.3	329	e 19 55	[+11]	e 33 3	+106	—	—
Rio Tinto	143.2	333	19 15	[-30]	—	—	—	91.2
San Fernando	144.1	332	20 9	[+22]	—	—	74.2	94.2
Rio de Janeiro	147.1	151	e 21 3	[+72]	—	—	43.8	—
	147.1	151	e 20 51	[+60]	—	—	43.6	—
Azores	148.3	357	21 27	[+94]	—	—	—	—

Additional records: Adelaide PR₁ = +8m.21s., SR₁ = +13m.11s. Melbourne PR₂ = +9m.27s., SR₁ = +16m.21s., SR₂ = +17m.27s. Manila MN = +20.3m., T₀ = 19h.40m.25s. Perth PR₁ = +10m.43s., SR₁ = +18m.27s. Kobe MN = +21.9m. Osaka MN = +22.1m., T₀ = 19h.40m.48s. Batavia: In forming the P and S residuals the records have been increased by 4m. Mizusawa PN = +8m.44s. Honolulu i = +18m.45s. Kodaikanal ($\Delta = 76^{\circ}.7$, Az. = 282°) gives P = 19h.30m.12s., L = 19h.55m.6s., M = 20h.28m.30s. Mauritius ($\Delta = 92^{\circ}.6$, Az. = 249°) gives PEN = 19h.35m.54s., LE = 20h.6m.36s., LN = 20h.5m.36s., ME = 20h.35m.6s., MN = +20h.22m.12s. Lick MN = +44.1m. Denver MN = +51.2m. Chicago L = +69.2m. Ann Arbor gives Bosch-Omori and Weichert readings. Helwan gives its records 1h. early. Toronto E = +19m.15s., iP = +24m.9s., and +26m.39s., and other L's. Ottawa gives a large number of L's, T₀ = 19h.48m.19s. Hamburg PR₁ = +23m.39s., PR₂ = +26m.48s., SR₁ = +39m.17s., SR₂ = +43m.1s., MN = +74.1m., MZ = +78.3m. Vienna PR₁ = +23m.54s., PR₂ = +26m.45s., PR₃ = +28m.25s., Athens PR₁ = +26m.49s., PS = +31m.25s., SR₁ = +34m.43s., LN = +53.4m., MN = +63.2m., T₀ = 19h.47m.39s. Washington L = +58.9m. and +68.2m. Northfield L = +60.7m., +75.2m., and +82.2m. Dyce iN = +25m.37s. Harvard eE = +21m.28s., eN = +21m.48s., eE = +36m.1s., iN = +39m.22s., iE = +39m.42s., L = +56.2m., and +60.3m. De Bilt e = +39m.15s. Eskdalemuir eN = +18m.37s. and -21m.39s. Pola MN = +67.7m. Uccle MN = +75.6m., MZ = +79.4m. Strasbourg MN = +80.3m. Pompeii L = +58.2m. Paris eE = +20m.24s., i = +22m.8s. Moncalieri MN = +81.2m. La Quiaca MN = +115.6m. La Paz PR₁N = +24m.7s. and +28m.3s., MN = +72.2m., L = +57.9m. and +64.0m. Barcelona PR₁ = +23m.38s., PR₂ = +29m.34s., SR₁ = +42m.17s. Algiers PR₁ = +22m.59s., MN = +83.2m. Coimbra gives a set of Milne observations given in the second of its two lines in the table, also PR₁ = +23m.58s., PSN = +31m.6s., SR₁ = +36m.28s., SR₂ = +42m.32s., LN = +60.0m., MN = +74.3m., T₀ = 19h.47m.38s. San Fernando MN = +89.2m.

May 6d. Records also at 0h. (San Fernando), 1h. (De Bilt), 3h. (Algiers), 6h. (Kodaikanal), 7h. (Harvard), 8h. (Helwan, Apia (2), and Balboa Heights), 10h. (Helwan), 12h. (La Paz), 14h. (Helwan), 18h. (Berkeley), 19h. (Colombo).

May 7d. 5h. 13m. 38s. Epicentre $6^{\circ}08'S$, $153^{\circ}00'E$.

(as on 1919 May 6d. 19h., but there is no evidence of high focus).

A = -·886, B = +·451, C = -·104; D = +·454, E = +·891;

G = +·093, H = -·047, K = -·995.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Sydney	27·9	183	5 10	-57	10 46	-11	15·6	17·0
Adelaide	31·8	203	6 51	+ 6	11 58	- 7	16·0	18·5
Apia	35·5	104	7 22?	+ 4	—	—	—	—
Manila	37·9	303	e 7 22	-15	—	—	—	—
Perth	43·3	228	8 29	+ 9	—	—	22·8	—
Tokyo	43·5	347	8 31	+ 9	—	—	—	—
Osaka	44·0	339	8 30	+ 4	16 50	+108	24·7	31·1
Batavia	45·9	268	e 8 44	+ 5	—	e 25·7	16·1	—
Mizusawa	E. 46·4	349	8 21	-22	14 49	-44	—	—
	N. 46·4	349	8 27	-16	15 16	-17	—	—
Zi-ka-wei	47·9	325	e 8 50	- 3	—	—	—	—
Honolulu	55·3	59	11 28	+107 (i 18 28)	+63	29·8	34·7	—
Calcutta	E. 69·3	299	10 52	-21	19 46	-32	—	—
Kodaikanal	76·7	282	30 46	?	—	—	49·2	53·6
Berkeley	89·4	52	—	—	—	e 35·9	—	—
Victoria	90·3	41	24 5	?S	(24 5)	-12	39·3	49·2
Mauritius	92·6	249	24 40	?S	(24 40)	- 1	50·0	53·0
Chicago	115·7	45	19 8	?PR ₁	29 22	+66	48·7	—
Ann Arbor	E. 118·3	45	22 22?	?PR ₁	31 58	?	56·4	68·4
Toronto	120·8	42	45 58	?SR ₁	e 59 16	?L	e 69·4	77·4
Cipolletti	121·2	142	—	—	—	—	68·2	69·8
Capetown	121·4	223	57 58	?L	—	—	(58·0)	74·0
Ottawa	122·4	39	e 20 34	?PR ₁	e 30 46	+99	e 50·4	—
Hamburg	123·7	333	e 20 22	?PR ₁	—	—	57·4	72·4
Vienna	124·0	326	19 6	[+ 3]	—	—	e 58·4	72·4
De Bilt	126·9	336	21 23	?PR ₁	—	e 57·4	60·5	—
Eskdalemuir	127·2	343	21 4	?PR ₁	—	—	59·4	82·7
Uccle	128·1	335	—	—	—	—	—	61·4
Strasbourg	128·3	330	20 22	?PR ₁	—	—	—	—
Bidston	128·7	342	22 40	?PR ₁	33 46	?	—	73·1
Andalgala	E. 129·3	133	—	—	—	—	76·2	83·7
Kew	129·4	339	—	—	—	—	—	87·4
Rocca di Papa	129·8	322	22 22	?PR ₁	37 52	?SR ₁	e 50·4	—
Paris	130·5	335	e 32 49	?S	—	—	67·4	92·4
Moncalieri	130·7	328	21 34	?PR ₁	31 7	+62	39·4	81·1
La Paz	133·5	119	e 19 28	[+ 2]	33 27	?	70·4	75·5
Coimbra	141·9	337	e 23 4	?PR ₁	34 56	?	62·4	—
Granada	142·3	329	19 22	[-22]	—	—	—	—
San Fernando	144·1	332	71 22	?L	—	—	(71·4)	112·4

Additional records : Adelaide gives PR₁ = +7m.58s., SR₁ = +14m.41s. Perth SR₁ = +18m.19s. Osaka MN = +30·5m., T₀ = 5h.11m.50s. Apia gives its record as 6d. Honolulu gives S as i, also i = +24m.34s. Calcutta PN = +11m.22s. (O - C. = +9s.). Victoria S = +29m.30s. Mauritius PN = +24m.22s. Chicago L = +54·4m., L = +61·4m., and L = +76·4m. Toronto E = +54m.52s., S? = +56m.52s., e = +62m.58s. Ottawa eSR₁? = +37m.22s., T₀ = 5h.21m.58s. Hamburg MN = +75·4m. De Bilt MN = +75·8m. Eskdalemuir MN = +78·5m. Paris MN = +89·4m. Moncalieri MN = +81·3m. La Paz PR₁ = +23m.10s. Coimbra L = +83·7m. San Fernando MN = +94·4m.

May 7d. Records also at 0h. (Colombo), 2h. (Ithaca), 3h. (Mizusawa), 4h. (Batavia), 5h. (Toronto), 6h. (Batavia, Manila, and Adelaide), 8h. (La Paz), 9h. (De Bilt and Manila), 10h. (Toronto, Victoria, De Bilt, Helwan, and Batavia), 11h. (Harvard and Edinburgh), 12h. (Manila), 19h. (Osaka, Mizusawa, and Tokyo), 20h. (Cheltenham and De Bilt), 21h. (Colombo), 22h. (San Fernando).

May 8d. 10h. 7m. 30s. Epicentre $21^{\circ}2'S$, $172^{\circ}5'W$. (as on 1919 May 6d. 4h.).

$A = -.924$, $B = -.122$, $C = -.362$; $D = -.130$, $E = +.991$;

$G = +.359$, $H = +.047$, $K = -.932$.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	7.4	6	1 56	+ 4	—	—	—	4.3
Sydney	34.4	240	8 0	?PR ₁	—	—	15.2	20.4
Melbourne	40.2	235	14 0	?S	(14 0)	-10	(19.5)	27.5
Honolulu	44.8	19	14 24	?S	(14 24)	-48	e 22.5	27.5
Adelaide	44.8	241	—	—	22 54	?L	(22.9)	29.1
Perth	63.9	245	—	—	—	—	33.2	—
Manila	74.5	292	e 12 27	+41	—	—	—	—
Victoria	82.3	30	—	—	—	—	40.1	45.0
Cipolletti	87.3	131	44 54	?L	—	—	(44.9)	54.0
La Paz	96.8	110	—	—	—	—	48.7	56.8
Chicago	100.3	49	12 0	?	24 50	-69	51.5	—
Toronto	106.6	48	—	—	—	—	55.5	61.2
Colombo	108.8	269	73 30	?L	—	—	(73.5)	—
Ottawa	109.5	47	—	—	—	—	e 57.5	—
Edinburgh	144.5	10	41 30	?SR ₁	—	—	—	81.0
Eskdalemuir	145.0	10	—	—	40 30	?SR ₁	—	—
Bidston	146.8	11	77 54	?L	83 48	?	(77.9)	98.5
Hamburg	147.6	357	e 20 6	[+14]	—	—	e 79.5	91.5
De Bilt	E. 149.1	2	e 20 11	[+17]	e 42 47	?SR ₁	e 81.5	89.4
Paris	152.1	7	e 20 30	[+31]	—	—	e 80.5	87.5
Vienna	152.1	347	20 21	[+22]	—	—	—	—
Strasbourg	152.7	358	5 28	?	—	—	—	—
Helwan	156.9	297	25 30	?PR ₁	—	—	—	—
Rocca di Papa	159.0	349	20 30	[+23]	—	—	—	37.5
San Fernando	160.7	35	87 30	?L	—	—	(87.5)	123.0

Additional records: Apia $i = +2m.30s.$ Sydney gives $P = 10h.5m.30s.$, assumed to be 10m. in error. Melbourne gives S as P and records $S = +19m.30s.$ Honolulu gives S as P and records $iS = +18m.12s.$ Adelaide gives L as S and records $SR_1 = +25m.14s.$, $L = +27.3m.$ Chicago $L = +70.5m.$ Toronto $E? = +43m.0s.$, $eL = +57.3m.$ Hamburg $MN = +89.5m.$ De Bilt $eE = +41m.11s.$, $eLN = +79.5m.$, $MN = +81.5m.$ San Fernando $MN = +117.5m.$

May 8d. Records also at 5h. (De Bilt, Simla, Honolulu, Taihoku, and Manila), 6h. (Taihoku, Calcutta, and De Bilt), 7h. (Zi-ka-wei), 8h. (Andalgala), 9h. (Apia), 18h. (Honolulu, Calcutta, Sydney, and Melbourne), 19h. (Manila, Honolulu, Melbourne, Sydney (2), Perth, Helwan, Ascension, and De Bilt), 21h. (Ottawa, Toronto, Chicago, Victoria, and Berkeley).

May 9d. Records at 1h. (Melbourne, La Paz, Manila, and Apia), 2h. (De Bilt), 7h. (Zi-ka-wei and Taihoku), 16h. (Helwan), 17h. (Coimbra), 18h. and 19h. (Helwan), 21h. (Paris and Athens), 22h. and 23h. (La Paz).

May 10d. 5h. 15m. 0s. Epicentre close to Nagasaki, which gives $P = 5h.15m.0s.$, $L = 5h.15m.8s.$

	Δ	P.	O - C.	L.	M.
	°	m. s.	s.	m.	m.
Osaka	4.8	1 43	+29	2.9	5.0
Zi-ka-wei	7.2	—	—	e 3.8	—

Osaka gives $MN = +1.6m.$

May 10d. Records also at 0h. (San Fernando), 2h. (Helwan), 6h. (Azores), 10h. (Tokyo), 13h. (Manila and Bidston), 15h. (Mizusawa), 18h. (De Bilt, La Paz, Eskdalemuir, and Helwan), 19h. (Helwan), 21h. (San Fernando).

May 11d. Records at 4h. (San Fernando), 5h. (Rocca di Papa and Kodaikanal), 7h. (De Bilt and Algiers), 9h. (Manila), 10h. (Apia and Chicago), 11h. (Helwan), 13h. (Manila and Tokyo), 14h. (Taihoku), 19h. (Ascension).

May 12d. Records at 0h. (San Fernando), 3h. (Mizusawa), 4h. (Apia), 6h. (Helwan), 11h. (Apia and Bidston), 14h. and 15h. (Apia), 19h. (Ascension), 20h. (Melbourne), 21h. (Lick and Berkeley).

May 13d. Records at 6h. (Batavia), 14h. (Manila), 23h. (San Fernando).

May 14d. Records at 3h. (Apia), 4h. (Victoria, Toronto, and Chicago), 5h. (De Bilt and Helwan), 12h. (Osaka and Helwan), 15h. (Mizusawa), 19h. (Ascension), 21h. (Batavia).

May 15d. Records at 0h. (San Fernando), 5h. (Rocca di Papa), 6h. (Manila), 12h. (Helwan), 19h. (Tortosa and Barcelona), 20h. (Lick), 22h. (Cipolletti), 23h. (Apia).

May 16d. 1h. 0m. 0s. Epicentre $21^{\circ}0'N$. $127^{\circ}0'E$. (as on 1915 July 2d.).

$$A = -\cdot562, B = +\cdot746, C = +\cdot358; \quad D = +\cdot799, E = +\cdot602; \\ G = -\cdot216, H = +\cdot286, K = -\cdot934.$$

Manila and the residuals generally suggest an addition of +10s. to T_0 and a deep focus, but the evidence is inadequate to justify introducing any correction.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	6.4	310	1 50	+12	—	—	3.7	3.9
Manila	8.6	223	e 2 13	+ 3	3 51	- 2	4.3	6.0
Zi-ka-wei	11.4	335	—	—	e 4 55	- 9	—	—
Osaka	15.6	27	3 49	+ 2	—	—	—	16.9
Colombo	47.7	260	15 0	?S	(15 0)	-50	—	—
Honolulu	69.2	74	e 24 54	?SR ₁	—	—	e 38.0	42.5
Helwan	84.4	300	23 0	?S	(23 0)	-12	—	—
Hamburg	88.0	328	—	—	e 23 0	-52	43.0	47.0
De Bilt	91.1	328	—	—	e 24 15	-10	e 42.0	49.8
Uccle	92.4	327	—	—	—	—	e 45.0	—
Edinburgh	92.4	335	30 0	?SR ₁	—	—	—	51.5
Rocca di Papa	92.8	316	13 6	-25	(e 18 42)	?PR ₁	e 18.7	39.6
Bidston	94.1	333	29 36	?	38 42	?L	(38.7)	51.4
Oxford	94.4	330	—	—	—	—	—	52.6
Paris	94.5	327	—	—	—	—	e 48.0	—
Shide	95.1	330	—	—	—	—	—	52.6
Coimbra	106.1	325	—	—	—	—	e 51.5	—

Additional records: Osaka gives MN = +14.7m. Helwan PN = +30m.0s. (SR₁). De Bilt eSR₁N = +30m.19s., eSR₁E = +30m.33s., e = +37m.14s.

May 16d. 11h. 44m. 20s. Epicentre $45^{\circ}0'N$. $135^{\circ}0'E$. (as was adopted for the revised determination of the earthquake on 1918 Jan. 30d. in the appendix to that year).

$$A = -\cdot500, B = +\cdot500, C = +\cdot707; \quad D = +\cdot707, E = +\cdot707; \\ G = -\cdot500, H = +\cdot500, K = -\cdot707.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa E.	7.4	220	1 49	- 3	3 13	- 8	—	—
N.	7.4	220	1 58	+ 6	3 14	- 7	—	—
Tokyo	10.0	157	3 25	+55	3 40	-49	—	—
Osaka	10.3	178	—	—	4 40	+ 3	5.8	6.6
Kobe	10.3	179	—	—	4 47	+10	6.1	6.5
Zi-ka-wei	17.4	222	—	—	e 7 3	-24	—	—

Additional records: Tokyo P may be a minute wrong. Osaka gives MN = +6.4m. Kobe MN = +6.6m.

May 16d. 21h. 1m. 35s. Epicentre $24^{\circ}0'N$. $123^{\circ}0'E$.

$$A = -\cdot498, B = +\cdot766, C = +\cdot407.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.7	0 23	- 3	—	—	0.5	0.6
Hokoto	3.2	—	—	1 22	- 6	1.9	2.3
Zi-ka-wei	7.3	—	—	e 2 48	-30	—	—
Manila	9.6	e 4 25	?S	(e 4 25)	+7	—	—
De Bilt	86.7	—	—	—	—	e 48.4	49.7

De Bilt gives also MN = +49.6m.

May 16d. Records also at 0h. (San Fernando and Strasbourg), 3h. (Colombo), 10h. (Edinburgh), 14h. (Apia), 18h. (Pompeii), 22h. (Helwan and Lick).

May 17d. Records at 0h. (Batavia), 6h. (Ithaca), 10h. (Tokyo and Bidston), 13h. (Rocca di Papa), 23h. (Cipolletti).

May 18d. 10h. 23m. 56s. Epicentre $56^{\circ}0'N$. $136^{\circ}0'W$.

A = -·402, B = -·389, C = +·829; D = -·695, E = +·719;
G = -·596, H = -·576, K = -·559.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Sitka	E.	1·1	19	0 18	+ 1	—	—	—	0·9
	N.	1·1	19	0 30	?S	(0 30)	- 1	—	1·0
Victoria		10·8	129	4 51	?S	(4 51)	+ 1	5·4	6·3
	Z.	10·8	129	4 48	?S	(4 48)	- 2	5·5	6·5
Berkeley		20·3	148	—	—	—	—	e 10·6	—
Chicago		33·9	93	13 4	?S	(13 4)	+25	(16·4)	—
Honolulu		38·3	214	—	—	—	—	16·6	17·1
Ithaca		39·7	84	e 19 44	?L	—	—	(e 19·7)	—
Northfield		40·7	79	—	—	—	—	e 19·6	—
Edinburgh		61·8	28	31 4	?L	—	—	(31·1)	—
Eskdalemuir		62·2	28	—	—	—	—	29·1	—
De Bilt		67·3	25	—	—	e 19 52	- 2	37·1	38·8

Chicago gives S as P and L as S, also $L? = +20\cdot1m$.
+43·6m.

De Bilt gives MN =

May 18d. 10h. 38m. 0s. Epicentre $24^{\circ}0'N$. $87^{\circ}0'W$.

A = +·048, B = -·912, C = +·407; D = -·999, E = -·052;
G = +·021, H = -·406, K = -·914.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Cheltenham	E.	17·0	28	—	—	7 16	- 2	—	7·6
	N.	17·0	28	—	—	7 12	- 6	—	8·0
Georgetown		17·1	27	e 3 5	-61	7 15	- 5	e 9·2	—
Washington		17·1	27	e 4 10	+ 4	7 7	-13	9·2	—
Ann Arbor	N.	18·5	8	4 24	+ 1	6 48	-63	10·4	—
Harvard	E.	22·6	32	e 4 55	-17	—	—	8·4	—
	N.	22·6	32	e 5 19	+ 7	—	—	7·6	—

Additional records: Ann Arbor gives $PE = +4m\cdot12s$.
+7·7m.

Harvard $LE? =$

May 18d. Records also at 0h. (San Fernando), 3h. (La Paz), 7h. (Manila), 8h. (Harvard), 9h. (Washington, Chicago, and Sitka), 12h. (Toronto), 13h. (Helwan), 14h. (Azores), 21h. (Apia (2), San Fernando, and Rocca di Papa), 22h. (De Bilt and Chicago), 23h. (Apia, Eskdalemuir, and Helwan).

May 19d. 3h. 55m. 54s. Epicentre $19^{\circ}0'N$. $144^{\circ}0'E$. (as on 1918 June 21d.).

A = -·765, B = +·556, C = +·326; D = +·588, E = +·809;
G = -·263, H = +·191, K = -·946.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo		17·1	348	4 16	+10	7 14	- 6	—	—
Osaka		17·4	336	4 8	- 2	—	—	7·9	8·9
Taihoku		21·6	290	9 4	?S	(9 4)	+ 7	—	—
Manila		22·5	262	e 5 12	+ 1	—	—	—	—
Zi-ka-wei		23·7	305	e 5 34	+ 9	—	—	—	—
Honolulu		54·1	78	e 23 18	?	—	—	29·1	32·2
Victoria		77·6	43	—	—	—	—	36·9	45·8
Helwan		98·9	306	66 6	?L	—	—	(66·1)	—
De Bilt		100·4	335	—	—	e 26 42	+42	e 48·1	56·4
Eskdalemuir		100·6	342	—	—	—	—	48·1	—
Bidston		102·2	340	40 18	?	51 6	?L	(51·1)	58·8
Chicago		102·7	37	—	—	—	—	e 49·6	—
Toronto		105·8	30	—	—	—	—	65·7	—
La Paz		149·3	90	19 28	[-27]	—	—	—	—

Additional records: Osaka gives $MN = +9\cdot9m$.

Helwan $PN = +65m\cdot6s$.

De Bilt $MN = +61\cdot7m$.

Eskdalemuir gives its record as on 18d.

Chicago $L = +51\cdot6m$ and $+59\cdot1m$.

May 19d. Records also at 8h. (La Paz), 10h. (Tokyo), 12h. (La Paz and Taihoku (2)), 18h. (Helwan), 23h. (Victoria).

May 20d. 4h. 20m. 12s. Epicentre $40^{\circ}5'N$. $122^{\circ}0'W$.

A = -403, B = -645, C = +649; D = -848, E = +530;
G = -344, H = -551, K = -760.

(See Note at end.)

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Berkeley	E.	2.6	186	—	—	—	—	e 2.5	5.0
	N.	2.6	186	—	—	—	—	e 2.7	6.0
Lick		3.1	174	e 1 12	-121	—	—	—	—
Victoria		8.0	354	1 23	-38	—	—	2.4	3.4
	Z.	8.0	354	—	—	—	—	2.3	3.4
Sitka	E.	18.7	337	6 48	?S	(6 48)	-67	e 7.8	—
Chicago		25.8	76	6 11	+25	11 0	+42	14.3	—
Ann Arbor	E.	28.5	74	—	—	—	—	17.1	17.8
Toronto		31.4	70	9 0	?PR ₁	—	—	18.5	21.9
Ottawa		33.5	65	6 59	-2	12 45	+13	17.3	—
Ithaca		33.7	71	—	—	e 19 5	?L	20.0	—
Georgetown		34.2	79	e 7 3	-4	e 12 31	-12	e 20.8	—
Washington		34.2	79	6 58	-9	—	—	e 20.4	—
Cheltenham		34.4	79	16 33	?L	—	—	20.8	—
Honolulu		36.0	250	13 24	?S	(13 24)	+14	—	—
Northfield		36.1	66	—	—	—	—	e 15.8	—
Harvard	E.	37.6	70	i 16 37	?SR ₁	20 8	?	e 22.3	25.2
	N.	37.6	70	i 16 47	?SR ₁	e 21 3	?	e 22.3	24.8
Edinburgh		70.6	31	24 48	?SR ₁	—	—	—	42.8
Eskdalemuir		71.0	31	—	—	i 20 30	-8	33.8	—
Bidston		72.4	33	21 0	?S	(21 0)	+5	—	40.4
Kew		75.0	33	—	—	—	—	—	43.8
Shide		75.2	35	—	—	—	—	—	46.0
De Bilt		76.7	30	—	—	e 21 44	-1	e 35.8	39.0
Hamburg		77.3	27	—	—	—	—	e 36.8	45.8
Uccle		77.4	30	—	—	—	—	—	39.8
Paris		78.2	35	—	—	e 21 59	-3	38.8	47.8
Coimbra		79.3	45	—	—	—	—	e 39.9	—
Strasbourg		80.5	32	—	—	—	—	42.4	—
San Fernando		83.1	47	47 48	?L	—	—	(47.8)	—
Rocca di Papa		88.1	31	21 48	?S	(21 48)	-125	e 50.2	55.8

Additional records: Chicago gives $L = +15.8m.$, $T_0 = 4h.20m.19s.$ Toronto eL = +21.5m. Ottawa gives many other L's, also $T_0 = 4h.19m.54s.$ Georgetown eN = +11m.48s. Harvard eN = +21m.24s., $T_0 = 4h.31m.11s.$ Eskdalemuir eN = +25m.2s., L = +39.8m. De Bilt eN = +30m.31s., eE = +30m.35s., MN = +44.0m. Strasbourg L = +45.4m.

May 20d. 4h. The above solution is about the best that can be given on the hypothesis of a single shock, but has many obvious defects. The Lick record for P is earlier than T_0 : the determination of T_0 suits Chicago and Georgetown, but not Ottawa, and there are no other records of both S and P: The epicentre should apparently be nearer Washington and Chicago, azimuth 78° , and also nearer Honolulu, azimuth 250° : and the same may be said of azimuths 180° and 350° . This last defect could be remedied by the hypothesis of a deep focus, but we have no evidence from antipodal stations.

But further it seems probable that there was a second shock about 4h.31m.11s., as suggested by Harvard (in the Notes). If the De Bilt observation (given in the Notes) eN = +30m.31s. may be taken as S, we have

	P.	S-P.	Δ	T_0
	m. s.	m. s.	$^{\circ}$	m. s.
Harvard	+16 37	3 31	18.8	+12 10
De Bilt	+21 44	8 47	66.2	+10 51

The accordance is none too good, but may perhaps be accepted as evidence of a second shock about 11min. later than the first, say at $19^{\circ}0'N$. $70^{\circ}0'W.$, as on 1917 July 13d. 5h. This would work out for the stations which possibly record this later shock, as follows:—

Continued on next page.

May 20d. 4h. 31m. 5s. At 19°·0N. 70°·0W. (as on 1917 July 13d. 5h.).

A = +·323, B = -·889, C = +·326.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	M. m.	M. m.
Cheltenham	20·6	5 40	+52	—	—	9·9	—
Harvard	23·4	15 44	-23	9 15	-18	e 11·4	14·3
Bidston	61·2	10 7	-13	—	—	—	—
Eskdalemuir	61·3	9 37	-44	—	—	22·9	—
Edinburgh	61·4	13 55	?PR ₁	—	—	—	21·9
Paris	64·4	e 11 6	+25	—	—	27·9	36·9
De Bilt	66·1	e 10 51	-1	19 38	0	e 24·9	28·2

May 20d. Records also at 0h. (Tokyo, San Fernando, Ootomari, and Helwan), 4h. (La Paz), 6h. (Helwan), 10h. (Helwan), 12h. (Bidston), 17h. (Simla), 19h. (San Fernando).

May 21d. Records at 0h. (Mizusawa), 1h. (San Fernando), 4h. (Manila), 5h. (Athens), 11h. (Taihoku), 17h. (La Paz), 18h. and 19h. (Helwan), 22h. (Lick), 23h. (Batavia and Manila).

May 22d. 11h. 52m. 36s. Epicentre 52°·0N. 178°·0W. (as on 1918 Dec. 9d.).

A = -·615, B = -·021, C = +·788; D = -·035, E = +·999;

G = -·788, H = -·028, K = -·616.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Honolulu	34·4	146	e 12 6	?S (e 12 6)	-40	e 15·8	17·3	
Victoria	34·4	76	—	(12 18)	-28	12·3	14·8	
Osaka	37·2	261	7 22	-10	—	—	20·3	
Berkeley	40·8	90	—	—	—	e 15·9	—	
Zi-ka-wei	48·2	271	e 8 45	-10	—	—	—	
Chicago	58·5	62	10 11	+ 9	18 10	+ 5	28·1	
Ann Arbor	50·2	59	—	—	—	37·4	—	
Manila	60·8	259	e 10 24	+ 6	—	—	—	
Toronto	61·5	55	—	—	(18 42)	0	e 36·5	42·8
Ottawa	62·0	51	10 26	+ 1	18 43	- 5	e 29·4	—
Northfield	64·4	50	—	—	e 37 24	?L	40·9	—
Washington	66·1	58	10 50	- 2	19 28	-10	e 32·2	—
Georgetown	66·1	58	e 10 44	- 8	19 25	-13	e 37·5	—
Harvard	66·5	50	10 34	-21	19 43	- 1	e 33·7	—
Edinburgh	72·0	3	20 24	?S	(20 24)	-26	—	—
Eskdalemuir	72·5	3	e 11 2	-31	e 21 5	+ 9	39·4	—
Hamburg	74·2	355	12 24	+41	—	e 37·4	45·4	—
Bidston	74·5	2	3 42	?	—	—	39·9	—
De Bilt	E. 75·8	357	—	—	—	e 38·4	45·0	—
N. 75·8	357	11 55	+ 1	21 44	+ 9	e 37·4	52·6	—
Kew	76·5	2	—	—	—	—	60·4	—
Uccle	77·1	358	e 12 0	- 2	e 21 54	+ 4	53·4	—
Vienna	79·0	350	12 13	0	22 54	+42	e 44·4	47·4
Paris	79·2	0	—	—	e 22 23	+ 9	43·4	—
Moncalieri	82·9	357	e 13 32	+57	22 58	+ 2	37·0	55·2
Rocca di Papa	85·8	352	e 12 30	-22	—	—	e 52·2	58·7
Tortosa	87·2	1	12 44	-16	23 17	-26	37·8	59·3
Coimbra	87·4	8	—	—	e 30 24	?	49·4	—
Kodaikanal	90·7	290	53 42	?L	—	—	(53·7)	—
Algiers	91·2	359	—	—	e 23 54	-32	—	—
San Fernando	91·3	6	55 54	?L	—	—	(55·9)	72·4
Colombo	91·9	285	55 24	?L	—	—	(55·4)	—
Helwan	94·2	335	26 24	?S	(26 24)	+86	—	—
La Paz	115·1	89	—	—	—	—	74·3	—

Additional records: Osaka gives MN = +23·2m. Chicago LE = +51·9m.
 T₀ = 11h.52m.52s. Toronto S is given as L, also L = +32·0m. Ottawa
 gives four other L's and T₀ = 11h.52m.48s. Washington L = +37·9m.
 Georgetown PN = +10m.42s. Harvard LE = +37·5m. and +40·6m.
 Eskdalemuir eE = +16m.34s., eN = +16m.38s., iN = +21m.7s. De Bilt
 eSR₁N = +27m.4s., T₀ = 11h.52m.40s. Paris MN = +55·4m. Helwan
 PN = +19m.24s.

May 22d. Records also at 0h. (San Fernando), 3h. (Athens), 6h. (Mizusawa and Batavia), 16h. (Melbourne), 19h. (Ascension), 21h. (Helwan), 22h. (San Fernando), 23h. (Helwan, La Paz (2), De Bilt, and Pilar).

May 23d. 3h. 7m. 35s. Epicentre $8^{\circ}28'. 79^{\circ}37'W.$ A = +.184, B = -.973, C = -.143; D = -.983, E = -.186;
G = -.026, H = +.140, K = -.990.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
La Paz	13.7	128	i 3 22	0	6 1	0	7.0	8.9
Andalgala	N. 22.9	149	13 37	?L	—	—	17.5	18.2
Pilar	E. 27.5	151	—	—	(10 25)	-25	10.4	18.0
Vieques	E. 29.7	27	10 35	?S	(10 35)	-54	—	—
Cipolletti	32.3	164	10 55	?S	(10 55)	-78	14.0	22.1
Toronto	51.9	0	—	—	—	—	26.0	32.6
Ottawa	53.7	5	i 8 28	-63	i 17 7	+ 2	e 24.4	—
Coimbra	81.1	48	e 12 8	-18	22 32	- 4	e 38.4	—
Honolulu	82.7	294	e 32 13	?	—	—	e 39.4	44.5
Bidston	88.6	38	24 1	?S	(24 1)	+ 2	(31.9)	40.7
Eskdalemuir	89.0	35	—	—	23 25	-38	—	—
Barcelona	89.1	49	—	—	—	—	e 49.5	—
Edinburgh	89.2	35	16 25	?PR ₁	—	—	—	—
Oxford	89.2	39	i 19 5	?	i 23 26	-39	—	—
De Bilt	E. 93.1	40	—	—	e 23 55	-51	e 45.4	53.4
	N. 93.1	40	—	—	e 24 28	-18	e 44.4	53.7
Moncalieri	93.7	46	e 17 11	?PR ₁	25 51	+58	42.1	—
Hamburg	96.3	37	—	—	—	—	e 47.4	55.4
Rocca di Papa	97.0	50	—	—	—	—	—	49.6
Helwan	112.0	61	26 25	?S	(26 25)	-81	—	—
Colombo	159.3	92	89 25	?L	—	—	(89.4)	99.4

Additional records: La Quiaca $\Delta = 19^{\circ}1'$ Az. = 138° gives L = 11.0m., M = +50.2m. What is the error in the time? Ottawa L = +37.4m.
Helwan PN = +30m.25s.May 23d. 6h. 10m. 38s. Epicentre $30^{\circ}0'N. 71^{\circ}0'E.$ (as on 1918 Nov. 29d.).A = +.282, B = +.819, C = +.500; D = +.946, E = -.326;
G = +.163, H = +.473, K = -.866.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Simla	5.5	76	1 22	- 3	2 22	- 9	—	4.2
Dehra Dun	6.0	85	2 42	?S	(2 42)	- 2	—	—
Bombay	11.2	171	1 36	-71	6 11	?L	(6.2)	—
Calcutta	E. 17.3	112	4 34	+25	8 34	+69	10.2	—
	N. 17.3	112	4 28	+19	8 4	+39	9.7	—
Kodaikanal	20.7	161	—	—	—	—	10.7	15.0
Colombo	24.5	158	11 22	?	13 28	?	13.8	16.1
Lenberg	40.2	313	e 9 34	?PR ₁	—	—	22.0	29.7
Zi-ka-wei	43.0	75	e 8 30	+12	—	—	—	26.2
Taihoku	44.8	83	20 22	?L	—	—	(20.4)	—
Vienna	45.0	311	18 34	+ 1	15 24	+ 9	e 27.9	35.9
Pompeii	46.5	299	8 49	+ 5	—	—	—	—
Pola	46.7	307	—	—	e 15 28	- 9	29.1	33.6
Rocca di Papa	47.8	301	e 9 19	+26	e 15 41	-10	e 27.3	34.5
Manila	48.3	98	e 9 50	+54	—	—	—	—
Hamburg	49.4	319	e 9 8	+ 5	—	—	e 24.4	31.5
Strasbourg	50.8	310	e 10 2	+50	—	—	e 29.4	—
Moncalieri	51.1	306	11 49	?PR ₁	16 31	- 1	26.8	32.4
De Bilt	E. 52.2	315	—	—	e 16 52	+ 6	e 27.4	35.5
	N. 52.2	315	—	—	e 16 48	+ 2	e 26.4	31.2
Uccle	52.8	314	—	—	e 17 22	+28	—	37.4
Osaka	53.7	68	e 9 5	-26	—	—	—	34.5
Paris	54.2	311	—	—	e 23 11	?SR ₁	32.4	36.4
Barcelona	55.6	303	—	—	e 17 1	-28	e 33.2	44.4
Oxford	56.3	317	9 36	-12	17 46	+ 8	31.0	40.1
Shide	56.4	315	17 43	?S	(17 43)	+ 4	32.8	39.2
Edinburgh	56.9	320	13 52	?PR ₁	—	—	—	39.4
Tortosa	56.9	303	9 52	+ 1	17 47	+ 2	35.6	—
Eskdalemuir	57.0	319	e 10 12	+20	e 19 40	+114	28.4	—
Bidston	57.1	317	16 22	?S	22 28	?SR ₁	—	33.4
San Fernando	63.2	299	37 22	?L	—	—	(37.4)	44.4
Coimbra	63.7	304	—	—	—	—	e 32.0	—
Melbourne	96.8	132	—	—	—	—	e 59.4	64.9
Victoria	100.6	10	55 45	?L	—	—	(55.8)	67.1
Toronto	101.5	340	—	—	—	—	58.0	61.4
Chicago	105.6	345	—	—	—	—	e 48.9	—
La Paz	140.4	281	—	—	—	—	68.5	72.8

Additional records: Zi-ka-wei gives MN = +25.2m. Pola MN = +31.3m.
Rocca di Papa L = +30.4m. Hamburg MN = +31.0m., MZ = +33.1m.
Moncalieri MN = +34.7m. Osaka MN = +32.3m. Paris MN = +32.4m.
Eskdalemuir LN = +33.4m. Coimbra L = +42.4m.

May 23d. 18h. 8m. 40s. Epicentre $30^{\circ}0'N$, $71^{\circ}0'E$. (as at 6h.).

$A = +.282$, $B = +.819$, $C = +.500$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.
Simla		5.5	76	e 1 20	- 5	—	—	—
Bombay		11.2	171	2 53	+ 6	—	—	—
Calcutta	E.	17.3	112	7 44	?S	(7 44)	+ 19	(8.7)
Helwan		34.2	280	20 20	?L	—	—	(20.3)
Hamburg		49.4	319	—	—	—	—	e 27.3
De Bilt		52.2	315	—	—	—	—	e 28.3

Calcutta gives $SN = +9m.20s.$ (?L).

May 23d. Records also at 0h. (Moncalieri, Eskdalemuir, and Edinburgh). 2h. (Rocca di Papa). 6h. (Taihoku (2)), 8h. (Vienna), 10h. (Taihoku), 12h. (Manila, Mizusawa, and Tokyo), 13h. and 15h. (La Paz), 19h. (Manila), 20h. (La Paz), 23h. (San Fernando).

May 24d. Records at 3h. (La Paz), 4h. (Algiers), 5h. (Manila), 9h. (Helwan, La Paz, and Taihoku), 10h. (Apia), 14h. (San Fernando), 19h. (Mizusawa and Ascension), 23h. (Mizusawa).

May 25d. Records at 11h. and 14h. (Manila), 18h. (Ascension), 21h. (La Paz and San Fernando), 22h. (La Paz and Manila).

May 26d. Records at 3h. (Batavia), 6h. (Rocca di Papa), 13h. (La Paz), 14h. (Bidston and Manila), 16h. (Manila), 17h. (Helwan), 19h. (Pompeii).

May 27d. 10h. 34m. 20s. Epicentre $37^{\circ}2'N$, $35^{\circ}4'E$.

$A = +.649$, $B = +.461$, $C = +.605$; $D = +.579$, $E = -.815$;

$G = +.493$, $H = +.350$, $K = -.796$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Helwan		8.1	206	3 40	+97	—	—	—	—
Athens	E.	9.3	278	e 2 19	- 1	—	—	5.2	5.8
	N.	9.3	278	—	—	4 19	+ 9	4.8	5.6
Lemberg		15.0	331	e 3 40	+ 1	e 6 46	+24	9.1	10.8
Budapest		15.8	316	e 3 34	-15	—	—	—	—
Pompeii		16.5	288	3 54	- 5	10 14	?L	(10.2)	—
Vienna		17.7	314	i 4 15	+ 2	i 7 40	+ 7	—	14.0
Pola		17.8	302	e 4 14	- 1	e 7 34	- 2	e 9.6	11.8
Rocca di Papa		18.0	292	i 4 16	- 1	e 7 49	+ 9	e 10.3	—
Moncalieri		22.1	299	i 5 20	+14	i 9 1	- 6	13.2	15.6
Zurich		22.1	306	e 5 2	- 4	—	—	—	—
Strasbourg		23.0	308	5 20	+ 3	9 30	+ 5	12.2	—
Hamburg		24.0	321	e 5 34	+ 6	—	—	e 13.7	16.7
De Bilt	E.	25.8	315	e 5 38	- 8	e 9 59	-19	13.3	19.1
	N.	25.8	315	—	—	—	—	14.3	17.4
Tortosa		27.1	289	6 12	+13	10 22	-21	11.9	18.4
Kew		28.8	311	—	—	—	—	—	19.7
Shide		29.2	309	—	—	—	—	—	21.2
Oxford		29.5	311	6 20	- 3	—	—	13.6	17.9
Eskdalemuir		31.9	317	—	—	—	—	15.7	—
Edinburgh		31.8	318	11 40	?S	(11 40)	-25	—	21.2
San Fernando		33.0	282	21 40	?L	—	—	(21.7)	22.7

Additional records: Pola gives $MN = +10.5m$.

Moncalieri $MN = +15.4m$.

$T_0 = 10h.35m.4s.$

Zurich $e = +1m.46s.$

Tortosa gives its record

apparently in Central European time—1h. east of Greenwich.

May 27d. 17h. 27m. 3s. Epicentre $54^{\circ}0'N$, $161^{\circ}0'E$.

$$A = -.556, B = +.191, C = +.809; \quad D = +.326, E = +.946; \\ G = -.765, H = +.263, K = -.588.$$

The epicentre $54^{\circ}5'N$, $164^{\circ}0'E$, used on 1917 Jan. 30, would suit the European Stations, but not Mizusawa or Zi-ka-wei.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E. 20.1	230	4 42	0	8 24	-1	—	—
Zi-ka-wei	36.2	248	—	—	(e 12 48)	-25	e 12.8	—
Honolulu	44.9	120	e 13 21	?S	e 18 45	?SR ₁	e 22.4	27.0
Manila	50.3	234	e 9 35	+26	—	—	—	—
Chicago	67.7	50	—	—	e 20 21	+23	38.3	—
Edinburgh	69.4	351	19 57	?S	(19 57)	-22	—	36.4
Toronto	69.6	42	—	—	—	—	36.6	41.4
Hamburg	69.8	342	i 11 16	0	—	—	e 35.0	43.0
Eskdalemuir	69.9	351	11 17	+1	20 25	0	35.0	—
De Bilt	72.0	346	11 31	+1	20 52	+2	e 35.0	42.8
Kew	73.4	350	—	—	—	—	—	52.0
Uccle	73.4	347	—	—	—	—	e 40.0	—
Vienna	73.5	338	—	—	—	—	e 46.0	—
Strasbourg	75.0	344	11 57	+8	—	—	—	—
Kodaikanal	78.0	272	48 33	?L	—	—	(48.6)	—
Moncalieri	78.4	342	—	—	e 31 20	?	41.6	—
Colombo	79.2	269	50 57	?L	—	—	(51.0)	54.0
Rocca di Papa	80.5	339	e 12 22	0	24 23	+114	e 42.8	53.8
	80.5	339	e 12 19	-3	—	—	—	12.8
Pompeii	81.0	335	12 21	-4	—	—	—	—
Tortosa	83.7	347	12 36	-4	23 1	-5	44.7	52.1
Helwan	N. 85.6	319	22 57	?S	(22 57)	-29	—	—
Rio Tinto	87.6	350	52 57	?L	—	—	(53.0)	68.0
San Fernando	N. 88.9	350	50 57	?L	—	—	(51.0)	62.0

Additional records: Toronto gives $L = +24.4m$. (?SR₁). De Bilt MN = $+48.9m$, $T_0 = 17h.27m.12s$. Helwan gives PE = $+24m.57s$. San Fernando PE = $+53m.57s$.

May 27d. Records also at 0h. (San Fernando and Helwan), 1h. (Helwan), 18h. (Mizusawa), 20h. (Helwan), 22h. (San Fernando).

May 28d. 3h. 3m. 55s. Epicentre $53^{\circ}5'N$, $163^{\circ}5'E$.

$$A = -.570, B = +.169, C = +.804; \quad D = +.284, E = +.959; \\ G = -.771, H = +.228, K = -.595.$$

This is a puzzling case. It is difficult to reconcile the fairly definite indications of the European stations with the absence of any records from China and Japan.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Honolulu	43.4	123	e 18 5	?SR ₁	—	—	21.1	26.1
Chicago	66.9	51	—	—	—	—	36.1	—
Hamburg	70.7	346	e 11 20	-1	—	—	e 41.1	49.1
De Bilt	72.8	348	11 35	0	20 55	-5	e 36.1	42.7
Strasbourg	75.9	345	11 58	+4	—	—	—	—
Paris	76.4	350	—	—	—	—	e 46.1	51.1
Moncalieri	79.3	345	—	—	—	—	e 43.6	—
Colombo	80.6	271	52 5	?L	—	—	(52.1)	—
Rocca di Papa	81.5	340	e 12 18	-10	—	—	—	12.4
Tortosa	84.5	349	12 38	-7	23 5	-9	47.1	57.8
Helwan	87.2	320	58 5	?L	—	—	(58.1)	—

De Bilt gives also MN = $+48.8m$, $T_0 = 3h.4m.9s$.

May 28d. 5h. 39m. 22s. Epicentre $37^{\circ}0'N$, $20^{\circ}5'E$. (as on 1918 July 5d.).

$$A = +.748, B = +.280, C = +.602; \quad D = +.350, E = -.937; \\ G = +.564, H = +.211, K = -.799.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	2.8	69	e 0 44	0	1 17	0	1.4	1.6
Pompeii	5.9	311	1 32	+1	3 22	+41	(3.4)	—
Rocca di Papa	7.6	311	1 35	-20	—	—	—	4.4
Helwan	11.6	125	12 38	?	—	—	—	—
Moncalieri	12.4	314	—	—	—	—	e 6.2	—
De Bilt	18.5	330	—	—	—	—	9.4	11.2

De Bilt also gives MN = $+10.5m$.

May 28d. Records also at 4h. (Helwan), 10h. (Colombo), 14h. (Manila), 18h. (Batavia), 19h. (Athens), 21h. (Ootomari), 22h. (San Fernando), 23h. (Lick).

May 29d. 10h. 59m. 45s. Epicentre $31^{\circ}5'N$. $100^{\circ}5'E$.

$$A = +155, B = +838, C = +522; \quad D = +983, E = +182; \\ G = -095, H = +514, K = -853.$$

A focal height 0.020 above the normal level has been assumed for this earthquake.

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.	
			Δ	Az.	m.	s.	m.	s.	m.	m.	
Calcutta	E.	+0.4	14.0	233	3	33	+ 1	6 33	+15	8.2	10.4
	N.	+0.4	14.0	233	3	39	+ 7	6 27	+ 9	8.2	10.4
Zi-ka-wei		+0.7	17.9	85	e 4	16	- 8	e 7 38	-15	—	10.9
Taihoku		+0.8	19.6	104	4	40	- 6	—	—	10.5	—
Simla		-0.8	19.9	275	e 9	3	? S	e 9 3	+25	—	13.2
Manila		+1.1	25.2	127	e 5	40	-11	10 57	+29	12.9	15.0
Bombay		+1.3	27.9	250	11	5	? S	(11 5)	-15	—	16.0
Kobe		+1.4	29.1	74	6	49	+16	—	—	—	17.8
Osaka		+1.4	29.3	74	6	47	+12	—	—	—	16.9
Kodaikanal		+1.4	30.1	230	12	9	? S	(12 9)	+ 9	19.2	24.8
Colombo		+1.4	31.2	224	10	15	?	—	—	—	23.2
Tokyo		+1.5	32.7	75	18	3	? L	—	—	(18.0)	—
Batavia		+1.7	38.2	171	e 7	22	-32	—	—	e 20.2	—
Lemberg		+2.4	58.1	312	30	33	? L	32 27	?	(30.6)	34.6
Helwan	E.	+2.4	58.4	289	19	9	? S	(19 9)	+36	—	39.8
	N.	+2.4	58.4	289	25	15	? L	—	—	(25.2)	39.9
Vienna		+2.5	63.4	314	11	1	+11	16 10	? PR ₁	30.2	36.8
Hamburg		+2.5	65.4	320	—	—	—	e 24 15	? SR ₁	e 34.2	37.0
Rocca di Papa		+2.6	68.1	309	e 20	13	? S	(e 20 13)	-21	e 38.8	42.2
Strasbourg		+2.6	68.6	315	—	—	—	e 28 15	? SR ₁	—	—
De Bilt	E.	+2.6	68.7	320	—	—	—	e 20 42	0	e 34.2	38.9
	N.	+2.6	68.7	320	—	—	—	e 20 43	+ 1	—	39.1
Uccle		+2.6	70.0	319	—	—	—	—	—	e 36.2	39.2
Moncalieri		+2.6	70.1	312	e 21	0	? S	(e 21 0)	+ 2	36.7	43.4
Edinburgh		+2.6	71.3	325	21	15	? S	(21 15)	+ 2	—	42.8
Paris		+2.6	71.6	318	—	—	—	—	—	36.2	—
Eskdalemuir		+2.6	71.6	325	—	—	—	—	—	30.2	—
Kew		+2.6	71.9	321	—	—	—	—	—	—	48.2
Oxford		+2.6	72.4	321	14	25	? PR ₁	i 21 23	- 3	—	—
Bidston		+2.6	72.5	322	29	21	? SR ₁	—	—	—	40.2
Shide		+2.6	72.8	320	21	28	? S	(21 28)	- 2	—	46.6
Barcelona		+2.6	75.3	311	—	—	—	e 30 15	? SR ₁	e 40.6	43.2
Coimbra		+2.7	82.8	315	—	—	—	e 29 15	? SR ₁	e 43.7	—
		+2.7	82.8	315	—	—	—	e 36 45	?	44.2	47.8
Rio Tinto		+2.7	83.0	311	41	15	? L	—	—	(41.2)	54.2
San Fernando		+2.7	83.5	310	43	15	? L	—	—	(43.2)	52.2
Ottawa		+2.9	103.1	358	—	—	—	—	—	e 55.2	—
Chicago		+2.9	106.4	7	—	—	—	—	—	59.2	—

Additional records: Zi-ka-wei gives MN = +10.2m., $T_0 = 10h.59m.50s$.
 Manila MN = +14.7m., $T_0 = 10h.58m.45s$. Kobe MN = +17.2m. Lemberg +33m.33s. Vienna gives its record as on 28d. Hamburg gives its record one hour too soon. Rocca di Papa eS = +28m.22s. De Bilt gives eN = +28m.20s., eE = +28m.30s. (1SR₁). Moncalieri S = +28m.33s. MN = +43.2m. Oxford i = +19m.10s. Coimbra gives a Milne record in addition to its usual one. San Fernando MN = +55.2m. Chicago L = +70.2m.

May 29d. Records also at 3h. (Manila), 6h. (Toronto), 8h. and 13h. (Taihoku), 18h. (Rio Tinto), 22h. (San Fernando), 23h. (Lick).

May 30d. Records at 0h. (Athens), 4h. (Manila), 12h. and 14h. (La Paz), 15h. (Helwan), 16h. (Osaka), 22h. (San Fernando), 23h. (Osaka).

May 31d. 16h. 2m. 40s. Epicentre $33^{\circ}2'N$. $138^{\circ}0'E$.

$A = -.622$, $B = +.560$, $C = +.548$.

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Osaka		2.6	1 2	+21	—	—	—	6.9
Tokyo		2.8	1 42	+58	—	—	(1.7)	—
Mizusawa	E.	6.4	1 28	-10	2 44	-11	—	—
	N.	6.4	2 26	?S	(2 26)	-29	(4.0)	—
Zi-ka-wei		14.2	e 3 34	+ 5	—	—	—	—
Manila		24.2	5 28	- 2	—	—	—	—
Hamburg		82.3	—	—	—	—	e 50.3	56.3
De Bilt		85.3	—	—	e 23 11	-11	e 47.3	59.4
Helwan		86.4	63 20	?L	—	—	(63.3)	—

Additional records: Osaka gives MN = +6.7m. The Osaka record is given as 30d. De Bilt MN = +53.0m. Helwan PN = +60m.20s.

May 31d. Records also at 0h. (La Paz and Manila), 5h. (Taihoku), 12h. (Denver), 14h. (Batavia), 21h. (De Bilt), 23h. (Mizusawa and Tokyo).

June 1d. 6h. 51m. 13s. Epicentre $25^{\circ}7'N$. $124^{\circ}8'E$.

$A = -.514$, $B = +.740$, $C = +.434$; $D = +.821$, $E = +.571$;
 $G = -.247$, $H = +.356$, $K = -.901$.

A depth of focus 0.040 has been assumed.

		Corr. for Focus	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku		+0.7	3.0	257	0 58	0	—	—	1.4	1.6
Hokoto		+0.1	5.2	247	2 1	+39	—	—	2.8	3.0
Zi-ka-wei		-0.1	6.2	333	e 1 32	- 1	2 33	-13	—	2.7
Manila		-0.6	11.7	199	2 49	+ 3	—	—	5.2	5.4
Kobe		-0.8	12.7	42	2 54	- 4	—	—	5.5	—
Osaka		-0.8	12.8	43	2 56	- 3	—	—	5.4	8.3
Tokyo		-1.2	16.2	48	3 40	+ 1	6 39	+ 7	—	7.6
Mizusawa		-1.5	19.2	42	4 13	0	7 39	+ 6	—	—
Ootomari		-2.1	25.3	30	e 6 17	+58	(9 21)	- 8	9.4	—
Batavia		-3.1	36.4	210	e 6 56	- 3	12 19	-10	—	14.3
Colombo		-3.7	46.7	256	8 47	+29	—	—	—	14.8
Kodaikanal		-3.8	47.3	261	14 35	?S	(14 35)	-20	16.1	17.1
Honolulu		-4.9	69.8	75	—	—	(19 17)	- 7	19.3	20.6
Vienna		-5.2	82.3	321	i 12 5	+ 3	23 23	+93	55.8	—
Hamburg		-5.2	82.9	328	e 12 8	+ 3	e 22 10	+13	e 41.8	48.8
De Bilt	E.	-5.3	86.1	328	12 23	- 1	22 36	+ 3	e 45.8	51.7
Strasbourg		-5.3	86.3	323	12 23	- 2	24 21	+106	48.0	—
Zurich		-5.3	87.1	321	e 12 27	- 2	—	—	—	—
Uccle		-5.3	87.2	327	12 27	- 3	e 22 41	- 4	—	—
Eskdalemuir		-5.4	87.6	333	12 29	- 2	22 49	+ 1	38.8	—
Rocca di Papa		-5.4	88.0	317	12 32	- 2	(e 23 47)	+54	e 23.8	25.0
Besançon		-5.4	88.7	325	12 37	- 1	—	—	—	—
Bidston		-5.4	88.9	330	23 47	?S	(23 47)	+44	—	53.3
Kew		-5.4	89.0	330	—	—	—	—	—	48.8
Moncalieri		-5.4	89.0	320	13 34	+54	24 34	+89	42.3	—
Oxford		-5.4	89.3	330	12 30	-11	i 23 8	- 2	—	—
Paris		-5.4	89.4	326	e 12 39	- 3	i 24 46	+98	46.8	—
Shide		-5.4	90.0	330	12 39	- 7	e 23 7	- 8	—	54.5
Rio Tinto		-5.5	101.8	322	—	—	27 47	?	—	63.8
Chicago		-5.6	106.5	24	i 24 32	?S	(i 24 32)	-92	42.8	—
La Paz		—	164.8	55	i 19 57	[-15]	—	—	46.3	—

Additional records: Zi-ka-wei gives MN = +2.9m., $T_0 = 6h.51m.30s.$ Manila MN = +5.3m. Osaka MN = +9.2m. Chicago seems to have an error of some 13m.20s. in the records. De Bilt $P_2 = +13m.21s.$, $S_2 = +24m.11s.$, $e = +28m.11s.$, $eN = +34m.29s.$, $T_{01} = 6h.51m.21s.$, $T_{02} = 6h.51m.41s.$ It would seem that De Bilt records a second shock 20s. later than the above from a more distant origin. Uccle $P_2 = +13m.23s.$ Eskdalemuir $PR_1?$ = +15m.58s., $T_0 = 6h.51m.20s.$ Rocca di Papa $S?$ = +16m.35s. ($?PR_1$). Bidston $S = +31m.17s.$ $S?$ = +36m.50s. Oxford $i = +24m.46s.$ Shide $S = +24m.53s.$ Chicago gives $S = +33m.24s.$ ($?SR_1$)

June 1d. 12h. 46m. 20s. Epicentre $30^{\circ}0'N$. $71^{\circ}0'E$. (as on 1919 May 23d.).

$$A = +.282, B = +.819, C = +.500; \quad D = +.946, E = -.326; \\ G = +.163, H = +.473, K = -.866.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Simla	5.5	76	e 2 28	?S	(e 2 28)	- 3	—	—
Bombay	11.2	171	4 42	?S	(4 42)	-17	—	—
Helwan	34.2	280	14 40	?L	—	—	(14.7)	—
Rocca di Papa	47.8	301	8 36	-17	—	—	—	9.8
Hamburg	49.4	319	e 9 22	+19	—	—	—	—
Strasbourg	50.8	310	9 34	+22	—	—	—	—
De Bilt E.	52.2	315	e 11 22?	PR ₁	e 17 8	+22	e 19.7	—
Edinburgh	56.9	320	16 40	?S	(16 40)	-65	—	—

De Bilt gives $e = +15m.42s$.

June 1d. Records also at 0h. (San Fernando), 6h. (San Fernando, Kobe, and La Paz), 14h. (Batavia and Manila), 15h. (Edinburgh, Helwan, Kodaikanal, Colombo, and Zi-ka-wei), 18h. (Tokyo), 21h. (La Paz and Rio de Janeiro), 22h. (Mizusawa).

June 2d. Records at 0h. (San Fernando), 3h. (Mizusawa), 5h. (La Paz), 6h. (Toronto), 7h. (Victoria), 9h. (Rocca di Papa), 23h. (Rocca di Papa, Osaka, Tokyo, and San Fernando).

June 3d. 7h. 24m. 28s. Epicentre $37^{\circ}0'N$. $20^{\circ}5'E$. (as on 1919 May 28d.).

$$A = +.748, B = +.280, C = +.602.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2.8	e 0 40	- 4	e 1 19	+ 2	1.4	1.8
Pompeii	5.9	1 34	+ 3	—	—	—	—
Rocca di Papa	7.6	e 1 51	- 4	—	—	—	3.8
Vienna	11.6	e 5 2	?S	(e 5 2)	- 7	(e 6.3)	—
Hamburg	18.1	—	—	—	—	e 8.5	12.5
De Bilt	18.5	—	—	—	—	e 9.8	—

Athens gives $iP = +0m.47s$, $PR_1N = +1m.16s$, $MN = +1.6m$. Vienna gives S as P and L as S .

June 3d. Records also at 0h. (Athens), 1h. (San Fernando), 4h. (De Bilt, Athens, and Rocca di Papa), 11h. (La Paz), 12h. (La Paz and Helwan), 14h. (Bidston and Mizusawa), 17h. (La Paz), 18h. (Rio Tinto), 20h. (Apia), 21h. (Edinburgh and Strasbourg).

June 4d. Records at 0h. (San Fernando), 1h. (Helwan, Simla, and Calcutta), 4h. and 5h. (La Paz), 7h. (Zurich and Chur), 8h. (Apia), 9h. (La Paz, Helwan, and Chicago), 10h. (Helwan), 11h. and 19h. (Manila), 21h. (Rocca di Papa).

June 5d. Records at 0h. (San Fernando), 2h. (Manila and Batavia), 3h. and 8h. (Helwan), 9h. (Sydney), 11h. (Bidston), 15h. (Taihoku), 17h. (Manila and Batavia), 19h. (Helwan), 22h. (Berkeley).

June 6d. Records at 4h. (Helwan), 10h. (Edinburgh), 11h. (Batavia), 13h. (Osaka and Kobe), 18h. (Rio Tinto (2)).

June 7d. 23h. 6m. 30s. Epicentre $26^{\circ}0'N$. $143^{\circ}0'E$. (as on 1919 May 1d.).

$$A = -.718, B = +.541, C = +.438.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	10.1	2 39	+ 8	4 27	- 5	—	6.9
Osaka	10.9	2 31	-12	—	—	—	6.6
Mizusawa E.	13.2	2 35	-41	3 50	-119	—	—
N.	13.2	2 41	-35	3 54	-115	—	—
Zi-ka-wei	19.6	e 4 37	+ 1	—	—	—	—
Apia	59.3	—	—	e 13 48	?PR ₁	14.6	—
De Bilt	93.7	—	—	—	—	e 48.5	60.4

Additional records: Osaka gives $MN = +6.8m$. De Bilt $MN = +61.6m$. The Apia records may refer to a local shock.

June 7d. Records also at 0h. (San Fernando, Taihoku, Kobe, and Osaka), 6h. (Manila), 8h. (Taihoku, Manila, and Mizusawa), 9h. (Mizusawa), 10h. (Mizusawa and Tokyo), 11h. (Batavia), 14h. (Kodaikanal (2)), 15h. (Rocca di Papa and Kodaikanal), 20h. (Batavia), 22h. (Rocca di Papa).

June 8d. 23h. 14m. 15s. Epicentre $34^{\circ}6'N$, $140^{\circ}7'E$. (as on 1919 May 4d.).

$$A = -.637, B = +.521, C = +.568.$$

		Δ	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo		1.3	e 0 26	+ 6	0 33	- 3	—	—
Osaka		4.3	—	—	2 4	+ 6	2.8	3.2
Mizusawa	E.	4.5	1 23	+13	1 56	- 8	—	—
	N.	4.5	1 18	+ 8	1 58	- 6	—	—
Kobe		4.6	2 37	+86	—	—	3.0	3.1
Taihoku		19.2	0 21	?	—	—	—	—

Kobe gives MN = +4.1m.

June 8d. Records also at 0h. (San Fernando and Helwan), 8h. (Osaka and Tokyo), 10h. (Simla), 16h. (Mizusawa, Tokyo, and Osaka), 18h. (Taihoku, Tokyo (2), and Zi-ka-wei), 21h. (Lick and Berkeley), 22h. (Mizusawa and Osaka).

June 9d. 7h. 13m. 35s. Epicentre $41^{\circ}5'N$, $34^{\circ}0'E$.

$$A = +.621, B = +.419, C = +.663, D = +.559, E = -.829, \\ G = +.549, H = +.371, K = -.749.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	E.	8.7	248	2 12	0	4 2	+ 6	4.5	4.9
	N.	8.7	248	—	—	4 0	+ 4	4.6	4.8
Lemberg		10.8	324	i 2 50	+ 9	i 4 45	- 5	e 5.7	11.4
Budapest	E.	12.2	304	2 31	-31	—	—	—	—
Vienna		14.1	304	3 31	+ 4	6 39	+29	i 8.3	11.3
Pompeii		14.6	273	3 34	0	6 55	+33	10.1	12.4
Rocca di Papa		15.9	278	e 3 50	- 1	8 16	?L	e 10.8	—
		15.9	278	e 3 56	+ 5	e 6 36	-17	e 8.4	10.1
Florence		16.8	285	2 25	-97	5 55	-78	—	7.3
Milan		18.4	291	4 29	+ 7	—	—	—	11.7
Zurich		19.0	297	e 4 31	+ 2	—	—	—	—
Moncalieri		19.4	289	4 36	+ 2	8 9	- 1	10.8	11.9
Strasbourg		19.8	300	4 41	+ 2	8 20	+ 1	10.9	13.6
Hamburg		20.1	315	e 4 46	+ 4	i 8 33	+ 8	e 12.3	16.3
Besançon		20.7	296	4 55	+ 6	8 50	+12	13.4	—
Marseilles		21.1	285	4 52	- 2	—	—	—	—
De Bilt		22.2	308	5 10	+ 3	9 10	+ 1	11.0	16.1
Uccle		22.4	305	e 5 8	- 2	e 9 13	0	e 12.4	14.4
Paris		23.2	299	e 5 17	- 2	e 9 31	+ 2	13.4	18.4
Barcelona		23.7	281	5 4	-21	9 27	-11	11.8	16.4
Algiers		24.3	270	e 5 26	- 5	—	—	13.4	16.9
Tortosa		25.1	280	5 37	- 2	9 55	-10	12.1	17.3
Kew		25.3	305	—	—	—	—	—	16.4
Oxford		26.0	306	5 46	- 2	10 25	+ 3	—	—
Bidston		27.4	308	9 25	?S	(9 25)	-83	(12.1)	18.4
Eskdalemuir		27.8	312	—	—	(10 45)	-10	10.8	—
Rio Tinto		31.2	276	9 25	?S	(9 25)	-149	22.4	—
San Fernando		31.4	273	13 25	?L	—	—	(13.4)	22.4
Simla		35.9	92	e 22 7	?L	—	—	(e 22.1)	—
Colombo		53.3	119	29 25	?L	—	—	(29.4)	—
Cape Town		76.8	193	41 19	?L	—	—	(41.3)	51.3
Chicago		81.5	320	—	—	—	—	e 41.4	—

Additional records: Athens gives iN = +2m.50s., iE = +2m.56s., m₁ = +4m.13s., m₂ = +4m.24s., m₃ = +4m.29s., T₀ = 7h.13m.35s. Moncalieri MN = +11.8m., T₀ = 7h.13m.46s. Hamburg MN = +12.4m., T₀ = 7h.13m.37s. De Bilt i = +5m.16s., MN = +13.6m., T₀ = 7h.13m.44s. Uccle iP = +5m.16s., T₀ = 7h.13m.36s. Paris ePN = +5m.23s., T₀ = 7h.13m.34s. San Fernando MN = +17.9m.

June 9d. 14h. 16m. 10s. Epicentre $39^{\circ}5'N$. $133^{\circ}3'E$.

$$A = -.529, B = +.562, C = +.636.$$

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Osaka		5.1	1 19	0	—	—	—	5.5
Mizusawa	E.	6.1	1 33	0	2 47	+ 1	—	—
	N.	6.1	1 50	+17	2 52	+ 6	—	—
Tokyo		6.4	1 36	- 2	5 19	?L	(5.3)	8.0
La Paz		150.5	19 16	[-40]	—	—	—	—

Osaka gives $MN = +9.7m$.

June 9d. 15h. 47m. 15s. Epicentre $41^{\circ}5'N$. $34^{\circ}0'E$. (as at 7h.).

$$A = +.621, B = +.419, C = +.663; \quad D = +.559, E = -.829;$$

$$G = +.549, H = +.371, K = -.749.$$

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens		8.7	248	e 2 1	-11	4 4	+ 8	4.5	4.8
Lemberg		10.8	324	i 4 41	?S	(4 41)	- 9	e 7.1	12.2
Helwan		11.8	191	6 45	?L	—	—	(6.8)	—
Vienna		14.1	304	i 3 25	- 2	—	—	8.6	13.4
Pompeii		14.6	273	4 29	+55	9 46	?L	(9.8)	—
Rocca di Papa		15.9	278	i 3 25	-26	—	—	—	4.2
Moncalieri		19.4	289	e 4 37	+ 3	8 20	+10	10.7	15.0
Strasbourg	Z.	19.8	300	4 34	- 5	—	—	—	—
Hamburg		20.1	315	e 6 45	?L	—	—	—	11.8
De Bilt		22.2	308	5 20	+13	—	—	e 12.8	16.3
Uccle		22.4	305	e 5 3	- 7	—	—	e 13.8	—
Paris		23.2	299	—	—	—	—	e 12.8	16.8

Moncalieri gives $MN = +15.2m$, $T_0 = 15h.47m.14s$. De Bilt $MN = +15.2m$.

June 9d. Records also at 0h. and 4h. (La Paz), 16h. (Apia), 17h. (Helwan), 21h. (Rocca di Papa).

June 10d. 20h. 9m. 15s. Epicentre $4^{\circ}0'N$. $144^{\circ}0'E$. (as on 1917 June 18d.).

$$A = -.807, B = +.586, C = +.070; \quad D = +.588, E = +.809;$$

$$G = -.056, H = +.041, K = -.998.$$

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila		25.0	297	—	—	e 10 2	- 1	—	—
Zi-ka-wei		34.5	325	e 4 58	-131	—	—	—	—
Sydney		38.5	171	7 45	+ 3	—	—	11.8	14.0
Melbourne		41.8	178	—	—	14 15	-17	16.6	17.8
Honolulu		58.8	67	e 21 21	?SR ₁	—	—	27.8	34.8
Victoria		88.8	41	—	—	—	—	53.8	60.2
Helwan	E.	107.4	302	70 45	?L	—	—	(70.8)	—
De Bilt	E.	114.0	334	—	—	e 47 21	?L	e 56.8	73.0
	N.	114.0	334	—	—	—	—	e 58.8	72.7
Toronto		118.4	36	—	—	—	—	48.6	49.4

Helwan gives $PN = +71m.45s$.

June 10d. Records also at 0h. (Mizusawa), 1h. (San Fernando), 2h. (Manila), 4h. (Sydney (2)), 5h. (Sydney), 7h. (Denver), 8h. (La Paz and Taihoku), 9h. (Helwan), 14h. (Manila and Taihoku), 15h. (Athens), 19h. (San Fernando), 21h. (Batavia and Kodaikanal), 22h. (Apia).

June 11d. Records at 3h. (Rocca di Papa), 5h. (Helwan), 6h. (La Paz, Melbourne, Manila, and Victoria), 7h. (Bidston, Sydney, Batavia, and De Bilt), 11h. (Ootomari), 12h. (Osaka), 13h. (La Paz), 14h. (Manila and Osaka), 18h. (San Fernando and Apia).

June 12d. Records at 5h. (La Paz), 11h. (Chicago, Sydney, Apia, and Melbourne), 12h. (Helwan and San Fernando), 13h. (Tokyo, Osaka, and Mizusawa), 15h. (Osaka and Mizusawa), 18h. (Strasbourg), 19h. (Osaka, Mizusawa, and Manila), 20h. (Helwan), 21h. (Hamburg).

June 13d. Records at 6h. (Helwan), 7h. (Bidston), 8h. (Manila), 11h. (La Paz), 12h. (Kodaikanal), 14h. (San Fernando), 17h. (Manila), 18h. (Lick, Kodaikanal, and Hamburg), 22h. (Colombo).

June 14d. Records at 3h. (Athens), 7h. (Berkeley), 8h. (Victoria), 21h. (Kobe and Osaka), 22h. (San Fernando), 23h. (Kobe and Osaka).

June 15d. 18h. 49m. 4s. Epicentre $30^{\circ}0'N$. $71^{\circ}0'E$. (as on June 1d. 12h.).

$$A = +.282, B = +.819, C = +.500; \quad D = +.946, E = -.326; \\ G = +.163, H = +.473, K = -.866.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Simla	5.5	76	i 2 32	?S	(i 2 32)	+ 1	—	3.7
Bombay	11.2	171	4 48	?S	(4 48)	-11	—	—
Calcutta	17.3	112	5 20	+71	7 2	-23	8.8	—
Helwan	34.2	280	12 56	?S	(12 56)	+13	—	—
Lemberg	40.2	313	8 50	+53	e 15 32	+82	—	18.0
Vienna	45.0	311	i 8 26	- 7	9 44	?	10.7	71.9
Pompeii	46.5	299	9 46	+62	11 30	?PR ₁	—	—
Rocca di Papa	47.8	301	i 8 53	0	—	—	—	10.2
Zurich	50.3	310	e 9 7	- 2	—	—	—	—
Strasbourg	50.8	310	9 9	- 3	—	—	—	—
Moncalieri	51.1	306	9 21	+ 7	(17 27)	+55	17.4	—
De Bilt	52.2	315	9 18	- 3	—	—	e 68.9	76.6
Uccle	52.8	314	e 9 22	- 3	—	—	—	—
Mizusawa	57.1	60	(10 2)	+ 9	10 2	?P	—	—
Honolulu	110.3	47	—	—	—	—	53.9	56.2

Additional records : Helwan gives PN = +13m.56s. Lemberg M = +15.9m.,
e = +16m.50s. Vienna PN = +8m.24s., SE = +9m.43s. Rocca di
Papa MN = +10.4m. De Bilt e = +20m.2s., MN = +80.8m.

June 15d. Records also at 0h. (Athens), 8h. (Helwan), 10h. (Chicago and Washington), 11h. (Helwan), 14h. (Batavia and Manila), 16h. (Victoria and Toronto), 17h. (Victoria), 18h. (Toronto), 19h. (Mizusawa), 20h. (Manila (2) and Moncalieri).

June 16d. Records at 5h. (Manila), 15h. (Lick and Ascension), 16h. (Colombo and Helwan), 22h. (San Fernando), 23h. (Apia).

June 17d. Records at 6h. (Melbourne and La Paz), 7h. (Helwan), 13h. (Batavia (2)), 14h. (Batavia), 17h. (Rocca di Papa), 22h. (Lick).

June 18d. Records at 0h. (Tokyo, Osaka, De Bilt, Mizusawa, and Zi-ka-wei), 1h. (Helwan and San Fernando), 3h. (Helwan, Zi-ka-wei, De Bilt, Manila, and Ootomari), 4h. (Ootomari and Mizusawa), 5h. (Pompeii), 6h. (Rocca di Papa and Helwan), 7h. (Mizusawa), 22h. (San Fernando).

June 19d. Records at 2h. (Denver), 3h. (Batavia), 4h. and 13h. (Mizusawa), 15h. (Barcelona), 20h. (Zurich), 21h. (Apia (2)), 22h. (Batavia), 23h. (San Fernando).

June 20d. Records at 4h. (Berkeley, Lick, Helwan, La Paz, and Manila), 5h. (Colombo), 12h. (Helwan), 13h. (Manila), 14h. and 17h. (Kodaikanal), 18h. (Lick, Kobe, and Kodaikanal), 21h. (Manila and San Fernando), 22h. (Manila).

June 21d. Records at 3h. (Tokyo), 4h. (Batavia, Apia, and Manila), 6h. and 8h. (Manila), 9h. (Batavia), 11h. (Manila, Lick, and Berkeley), 20h. (Batavia), 23h. (La Paz).

June 22d. Records at 0h. (San Fernando), 6h. (Batavia), 7h. (Strasbourg), 16h. (Manila), 21h. (Apia).

June 23d. 6h. 26m. 10s. Epicentre $41^{\circ}0'N$. $144^{\circ}0'E$. (as on 1917 Nov. 15d.).

$$A = -\cdot611, B = +\cdot444, C = +\cdot656; D = +\cdot588, E = +\cdot809;$$

$$G = -\cdot531, H = +\cdot386, K = -\cdot755.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	2-9	230	0 37	- 8	1 6	-14	—	—
Ootomari	5-7	351	e 1 29	+ 1	—	—	2-4	—
Tokyo	6-3	214	1 44	+ 8	2 56	+ 4	—	5-2
Osaka	9-2	230	2 27	+ 8	(4 13)	+ 5	4-2	5-3
Kobe	9-4	231	2 29	+ 7	(4 17)	+ 4	4-3	5-4
Hamburg	77-5	334	—	—	e 21 50	- 5	e 42-8	46-8
De Bilt	80-3	336	—	—	e 21 50	-37	e 39-8	47-8
Bidston	81-5	341	27 14	?SR ₁	33 2	?	—	50-1
Paris	84-0	336	—	—	—	—	e 46-8	53-8
Helwan	85-7	307	50 50	?L	—	—	(50-8)	—

Additional records: Mizusawa gives SN = +1m.5s. Osaka MN = +5-5m.
 Kobe MN = +5-5m. Hamburg MN = +47-8m. De Bilt MN = +52-1m.
 Helwan PN = +49m.50s.

June 23d. Records also at 1h. (San Fernando), 2h. (Batavia), 13h. (Apia), 15h. (Helwan).

June 24d. 18h. 34m. 30s. Epicentre $17^{\circ}3'N$. $120^{\circ}5'E$. (determined by De Bilt).

$$A = -\cdot485, B = +\cdot823, G = +\cdot297; D = +\cdot862, E = +\cdot508;$$

$$G = -\cdot151, H = +\cdot256, K = -\cdot955.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	2-8	170	e 0 51	+ 7	—	—	1-4	5-8
Taihoku	7-8	7	e 0 30	?	—	—	—	—
Osaka	21-9	35	5 3	- 1	—	—	9-1	10-2
Batavia	27-1	211	e 5 50	- 9	—	—	—	—
Colombo	41-0	261	13 30	?S	(13 30)	-51	—	25-5
Honolulu	76-1	73	—	—	—	—	41-5	51-5
Helwan	80-8	299	23 30	?S	(23 30)	+57	—	—
Hamburg	87-7	327	e 12 47	-16	e 23 30	-19	e 46-5	55-4
De Bilt	91-0	326	—	—	e 23 42	-42	e 45-5	55-4
Strasbourg	91-3	322	—	—	—	—	e 49-5	—
Eskdalemuir	93-3	332	—	—	—	—	50-5	—
Kew	94-1	329	—	—	—	—	—	57-5
Paris	94-2	325	—	—	—	—	48-5	—
San Fernando	106-4	320	12 30	-131	—	—	—	—

Additional records: Manila gives MN = +7-1m. Osaka MN = +10-4m.
 Helwan PN = +24m.30s. (?S). Hamburg MN = +49-5m. De Bilt
 MN = +50-8m., also Epicentre $17^{\circ}3'N$. $120^{\circ}5'E$., as adopted.

June 24d. Records also at 0h. (San Fernando), 2h. (La Paz), 5h. (Zurich), 11h. (Mizusawa), 13h. (Helwan and Taihoku), 19h. (Manila (2)), 20h. (Helwan), 21h. (Manila and Point Loma), 22h. (San Fernando), 23h. (Manila).

June 25d. Records at 4h. (Batavia), 9h. (Helwan), 16h. (Manila), 17h. (San Fernando and Helwan), 20h. (Rio Tinto).

June 26d. 18h. 58m. 0s. Epicentre $34^{\circ}5'N$. $10^{\circ}0'W$. (as on 1918 Sept. 15d.).

$$A = +\cdot812, B = -\cdot143, C = +\cdot566; D = -\cdot174, E = -\cdot985;$$

$$G = +\cdot558, H = -\cdot098, K = -\cdot824.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tortosa	10-4	50	2 51	+15	—	—	6-3	7-6
Algiers	10-9	74	4 38	?S	(4 38)	-14	5-8	6-2
Barcelona	11-8	50	—	—	—	—	e 6-0	8-0
Paris	17-0	29	—	—	—	—	e 10-0	—
Uccle	19-4	28	—	—	—	—	e 11-0	—
De Bilt	E. 20-7	27	—	—	—	—	12-4	14-8
N. 20-7	27	—	—	—	—	—	e 12-0	15-2
Hamburg	23-7	30	—	—	—	—	e 14-0	15-2
Helwan	35-0	86	24 0	?L	—	—	(24-0)	—

Additional records: Hamburg gives MN = +16-6m. Helwan PN = +22m.0s. (1L).

June 26d. Records also at 1h. (San Fernando), 2h. (Honolulu), 4h. (La Paz), 5h. (San Fernando), 9h. (Helwan), 11h. (Strasbourg), 17h. (Apia, Kodaikanal, and Melbourne), 18h. (Rio Tinto).

June 27d. Records at 9h. (Manila), 19h. (Melbourne and San Fernando), 20h. (Helwan and De Bilt).

June 28d. 4h. 40m. 50s. Epicentre $4^{\circ}5'S$, $131^{\circ}0'E$. (as on 1915 May 5d.).

$$\begin{aligned} \Delta &= -.654, B = +.752, C = -.078; & D &= +.755, E = +.656; \\ G &= -.051, H = -.059, K = -.997. \end{aligned}$$

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila		21.5	333	e 4 54	- 5	—	—	—	—
Batavia		24.1	267	e 5 24	- 5	—	e 13.8	11.1	—
Taihoku		30.9	343	3 16	?	—	—	—	—
Perth		30.9	206	10 10	?	—	—	—	—
Adelaide		31.2	168	11 58	?S	(11 58)	+ 4	20.0	21.4
Melbourne		35.7	161	—	—	13 4	- 2	21.2	24.9
Colombo		52.4	282	33 10?	?L	—	—	(33.2?)	36.2
Kodaikanal		55.4	286	33 4	?L	—	—	35.1	37.2
Honolulu		74.2	66	e 32 10	?L	—	—	45.0	48.3
Helwan		100.6	298	25 10	?S	(25 10)	-51	—	—
Hamburg		111.6	327	—	—	—	—	e 56.2	—
De Bilt	E.	114.9	326	—	—	—	—	e 58.2	61.3
	N.	114.9	326	e 22 10	?	—	—	e 57.2	61.5
Uccle		115.9	325	—	—	—	—	e 62.2	—
Eskdalemuir		116.0	333	—	—	—	—	55.2	—
Bidston		117.3	331	55 28	?L	62 34	?	(55.5)	77.7
La Paz		151.7	138	20 10	[+12]	—	—	—	—

Additional records: Adelaide gives $PR_1 = +13m.10s.$, $S = +15m.40s.$, $SR_1 = +16m.46s.$ Perth $+59m.10s.$ Melbourne $SR_1 = +16m.4s.$ Helwan $PN = +24m.10s.$ (7S). De Bilt $T_0 = 4h.40m.39s.$ Epicentre $4^{\circ}9'S$, $131^{\circ}5'E$. Bidston $PR_1 = +59m.16s.$

June 28d. 10h. 26m. 53s. Epicentre $35^{\circ}0'N$, $90^{\circ}5'E$.

$$\begin{aligned} \Delta &= -.007, B = +.819, C = +.574; & D &= +1.000, E = +.009; \\ G &= -.005, H = +.574, K = -.819. \end{aligned}$$

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Simla		11.8	255	e 9 1	?	—	—	—	9.6
Calcutta	E.	12.6	189	3 7	0	5 25	- 9	—	—
	N.	12.6	189	3 7	0	5 43	+ 9	—	—
Zi-ka-wei		26.1	90	—	—	e 8 36	-108	—	—
Kodaikanal		27.5	208	17 55	?L	—	—	(17.9)	—
Taihoku		28.5	102	6 14	+ 1	—	—	8.5	8.9
Colombo		29.8	202	16 7	?L	—	—	(16.1)	—
Manila		34.2	119	e 6 59	- 8	—	—	—	—
Batavia		44.0	156	—	—	—	—	e 18.2	—
Helwan		49.5	282	26 7	?L	—	—	(26.1)	—
Hamburg		57.2	316	—	—	—	—	e 36.1	42.1
De Bilt	E.	60.4	315	—	—	—	—	e 38.1	41.3
	N.	60.4	315	—	—	—	—	e 34.1	39.3
Bidston		63.7	319	17 31	?S	(17 31)	-98	—	43.8

Additional records: Zi-ka-wei gives $e = +2m.54s.$ Helwan $PN = +25m.7s.$

June 28d. Records also at 1h. (San Fernando and Vieques), 2h. (Helwan and De Bilt), 3h. (Batavia), 16h. (Manila and Helwan), 17h. (San Fernando), 19h. (Athens), 21h. (Mizusawa), 22h. (San Fernando).

June 29d. Sh. 14m. 37s. Epicentre 43° 8'N. 11° 2'E.

A = +.708, B = +.140, C = +.692; D = +.194, E = -.981;
G = +.679, H = +.134, K = -.722.

This earthquake was originally attributed to the epicentre active on 1918 Nov. 6d., viz., 44° 6'N. 13° 3'E. But the next shock (at 15h.) is obviously from an origin near Florence, and it seems probable that this was a preliminary disturbance from the same place.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 0	0	—	—	—	0.2
Pola	2.2	61	e 0 26	- 8	—	—	e 0.8	2.4
Rocca di Papa	2.3	152	e 0 40	+ 4	—	—	—	1.7
Moncalieri	2.8	295	0 57	+13	1 24	+ 7	1.6	—
Pompeii	3.9	142	1 10	+ 9	—	—	2.2	2.7
Zurich	E. 4.0	332	e 1 3	+ 1	i 2 4?	+14	—	2.3
N. 4.0	332	e 1 2	0	i 2 6	+16	—	—	2.4
Marseilles	4.3	266	e 1 57	?S	(e 1 57)	- 1	(e 2.7)	—
Besancon	5.0	316	2 21	?S	(2 21)	+4	—	—
Strasbourg	5.3	334	1 21	- 1	2 50	+25	(2.8)	—
Vienna	5.7	37	1 53	+25	2 48	+12	3.2	3.8
Paris	7.8	313	e 2 18	+20	—	—	4.4	6.4
Uccle	8.4	329	e 3 47	?S	(e 3 47)	0	—	—
De Bilt	9.2	336	—	—	—	—	e 4.8	—
Hamburg	9.8	356	—	—	—	—	e 4.6	7.5

Additional records: Zurich gives iPN = +1m.17s., iPE = +1m.18s., ePV = +1m.2s. Hamburg MN = +5.6m.

1919. June 29d. 15h. 6m. 12s. Epicentre 43° 8'N. 11° 2'E.
(as at 8h.).

A = +.708, B = +.140, C = +.692; D = +.194, E = -.981;
G = +.679, H = +.134, K = -.722.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 1	+ 1	—	—	—	—
Pola	2.2	61	i 0 29	- 5	(e 0 51)	- 9	e 0.8	1.5
Rocca di Papa	2.3	152	i 0 39	+ 3	1 8	+ 5	7.7	1.8
Moncalieri	2.8	295	0 50	+ 6	1 17	0	1.8	2.1
Chur	3.2	338	0 52	+ 2	i 1 36	+ 8	—	—
Pompeii	3.9	142	i 1 1	0	—	—	2.2	3.8
Zurich	E. 4.0	332	e 1 2	0	i 2 7	+17	—	2.6
N. 4.0	332	e 1 2	0	i 2 12	+22	—	—	2.5
V. 4.0	332	e 1 2	0	i 2 13?	+23	—	—	2.5
Marseilles	4.3	266	i 1 10	+ 3	e 2 10	+12	—	3.1
Neuchatel	4.4	318	1 8	0	—	—	—	—
Besancon	5.0	316	1 20	+ 3	1 54	-23	3.8	—
Strasbourg	5.3	334	1 20	- 2	2 24	- 1	—	—
Vienna	5.7	37	i 1 24	- 4	2 13	-23	2.6	3.3
Barcelona	7.0	254	e 1 45	- 1	3 28	+18	4.2	5.3
Paris	7.8	313	e 1 56	- 2	e 3 26	- 5	4.2	5.8
Tortosa	8.4	253	2 10	+ 3	3 51	+ 4	4.2	16.2
Uccle	8.4	329	2 3	- 4	3 35	-12	3.8	—
De Bilt	9.2	336	2 13	- 6	4 3	+ 5	4.4	5.8
Algiers	9.3	224	2 22	+ 2	4 18	+ 8	5.6	7.3
Hamburg	E. 9.8	356	e 2 27	0	e 4 15	- 8	—	7.9
N. 9.8	356	e 2 25	- 2	i 4 31	+ 8	—	—	5.5
Lemberg	10.7	51	i 2 30	-10	e 4 12	-36	e 6.7	7.8
Kew	10.8	319	—	—	—	—	—	6.8
Athens	E. 11.2	117	e 2 39	- 8	e 5 23	+24	e 6.2	8.1
N. 11.2	117	—	—	—	e 5 1	+ 2	e 5.7	8.3
Oxford	11.5	318	2 48	- 4	4 55	-12	5.2	8.3
Bidston	13.4	321	6 30	?L	8 0	?	(6.5)	—
Rio Tinto	14.7	252	1 48	?	—	—	—	6.8
Eskdalemuir	14.8	326	—	—	5 48	-39	—	—
Coimbra	E. 15.0	263	3 29	-10	6 43	+11	—	9.4
N. 15.0	263	—	—	—	6 29	- 3	7.8	9.3
San Fernando	15.2	247	3 12	-30	—	—	7.3	7.8
Helwan	21.2	124	4 48	- 7	—	—	—	—
Ottawa	58.6	307	9 58	- 5	e 18 6	0	e 28.3	—
Toronto	61.8	307	—	—	—	—	33.6	37.4
Georgetown	63.2	300	e 11 17	+44	i 15 34	?	—	—
Chicago	67.7	309	19 52	?S	(19 52)	- 6	32.1	—
Victoria	79.5	331	—	—	—	—	—	45.6
La Paz	93.9	253	12 18	-79	—	—	—	—

For Notes see next page.

NOTES TO JUNE 29d. 15h. 6m. 12s.

Additional records: Moncalieri gives MN = τ 2.0m., T_0 = 15h.6m.26s. Zurich
 iPE = +1m.17s., iE = +1m.22s., iPN = +1m.16s., iN = +1m.23s., iV =
 τ 1m.23s., T_0 = 15h.6m.12s. Marseilles MN = τ 2.7m., T_0 = 15h.6m.7s.
 De Bilt MN = +8.6m., T_0 = 15h.6m.11s. Athens e = +4m.32s., T_0 =
 15h.5m.57s. San Fernando MN = 10.8m. Ottawa ePR₁N = +12m.28s.,
 T_0 = 15h.6m.5s. Toronto L = +36.3m. Georgetown iN = +15m.36s.
 Chicago S = -24m.29s. (?SR₁), L = +39.8m.

June 29d. 16h. 36m. 15s. Epicentre 43° 8N. 11° 2E. (as at 15h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Pola	2.2	61	e 0 21	-13	—	—	e 0.7	0.8
Rocca di Papa	2.3	152	i 0 32	-4	i 1 8	+ 5	—	1.6
Moncalieri	2.8	295	0 56	-12	i 1 19	+ 2	1.8	—
Chur	3.2	338	e 0 46?	-4	i 1 22	- 6	—	—
Pompeii	3.9	142	e 1 0	-1	2 0	+ 13	(2.0)	2.5
Zurich	E. 4.0	332	e 0 55	-7	i 2 4	+14	—	2.2
N. 4.0	332	e 0 54	-8	i 1 46	- 4	—	—	—
Strasbourg	5.3	334	2 2	?S	(2 2)	-23	2.9	—
Vienna	5.7	37	e 1 10	-18	2 10	-26	2.5	3.6
De Bilt	9.2	336	—	—	—	—	e 4.8	—
Hamburg	9.8	356	—	—	—	—	e 5.0	—

No additional records.

1919. June 29d. 23h. 14m. 15s. Epicentre 14° 5N. 86° 0W.

(as on 1918, June 13d.).

A = +.068, B = -.966, C = +.250; D = -.998, E = -.070;

G = +.017, H = -.250, K = -.968.

Lick, Berkeley, and La Paz suggest a possible deep focus, but there is no support for this from the antipodal stations.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	E. 8.3	130	2 59	+53	4 45	+60	6.0	7.7
N. 8.3	130	3 5	+59	4 41	+56	6.1	—	—
Port au Prince	13.7	71	e 3 4	-18	6 51	+50	(6.9)	8.7
Vieques	E. 20.0	77	4 57	+16	8 56	+33	11.2	15.4
N. 20.0	77	5 12	+31	9 28	+65	11.9	15.8	—
Cheltenham	E. 25.6	17	5 59	+15	10 39	+25	17.1	16.5
N. 25.6	17	5 59	+15	10 40	+26	15.1	19.5	—
Georgetown	E. 25.7	16	e 5 53	+8	i 10 33	+17	e 12.2	12.9
Z. 25.7	16	e 5 53	+8	e 10 34	+18	e 12.2	12.9	—
Washington	25.7	16	5 51	+6	10 33	+17	13.2	—
Chicago	27.3	357	6 0	-1	10 40	- 6	13.1	—
Ann Arbor	E. 27.9	4	6 9	+2	11 3	+ 6	13.8	14.8
N. 27.9	4	6 27	+20	11 21	+24	14.2	15.8	—
E. 27.9	4	6 15	+8	11 3	+6	—	15.8	—
N. 27.9	4	6 27	+20	11 9	+12	15.0	15.8	—
Tucson	28.8	312	11 45	?S	16 39	?L	24.8	—
Ithaca	29.1	14	e 6 13	-6	i 10 59	-20	—	—
Toronto	29.7	10	7 39	+74	12 9	+40	18.0	19.2
Northfield	31.8	20	6 45	0	12 5	0	15.0	—
Ottawa	32.1	12	i 6 46	-2	i 12 9	- 1	17.2	—
La Paz	35.6	151	i 6 53	-25	i 12 18	-46	15.9	21.2
Lick	39.0	315	—	—	e 13 15	-37	—	—
Berkeley	39.7	315	e 7 30	-22	—	—	—	26.1
La Quiaca	E. 41.7	152	33 45?	?	—	—	40.4	41.2
N. 41.7	152	—	—	—	—	—	39.8	51.8
Victoria	45.7	326	8 4	-34	14 27	- 57	23.8	34.0
Andalgala	46.2	155	—	—	(15 33)	+ 2	15.6	16.2
Pilar	50.8	155	8 33	-39	—	—	—	24.0
Cipolletti	56.0	163	11 3	?PR ₁	—	—	24.2?	40.2
Honolulu	68.4	288	11 3	-4	e 20 27	+20	e 31.2	35.0
Coimbra	71.3	51	e 11 26	+1	i 20 54	+12	31.1	36.8
71.3	51	11 25	0	21 15	+33	33.2	35.4	—
Rio Tinto	72.9	55	8 45	?	—	—	62.8	—
San Fernando	73.3	56	11 15	-23	—	—	—	39.8
Eskdalemuir	74.0	35	11 43	+1	21 24	+10	36.8	39.6
Bidston	74.2	40	4 27	?	10 45	?	—	31.0

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Oxford	75.4	41	12 13?	+22	21 35	+5	26.1	40.8
Kew	76.1	40	20 45	?S	(20 45)	-53	—	44.8
Tortosa	78.0	50	12 16	+9	22 11	+11	31.4	40.7
Paris	78.2	42	e 12 30	-22	e 22 6	-4	34.8	42.8
Uccle	79.0	40	e 12 33	+20	e 22 15	-3	e 33.8	42.8
Barcelona	79.1	50	e 12 14	0	i 22 18	+5	e 31.5	40.1
De Bilt	79.3	39	12 27	+12	22 22	+7	38.8	40.7
Algiers	80.7	54	e 12 56	+33	22 32	+1	34.8	40.8
Besançon	80.8	44	12 43?	+19	—	—	39.8	—
Marseilles	81.2	48	—	—	—	—	39.8	—
Strasbourg	81.6	42	12 25	-3	22 43	+1	39.8	45.2
Hamburg	81.9	37	e 12 59	+29	i 22 45	0	e 37.2	45.2
Moncalieri	82.4	45	e 1 1	?	i 22 44	-6	39.3	47.0
Zurich	82.5	44	e 12 32	-1	—	—	—	—
Pola	86.6	45	e 23 16	?S	(e 23 16)	-21	e 36.8	44.9
Rocca di Papa	86.7	47	e 12 52	-5	e 23 17	-21	e 41.6	—
Vienna	87.2	40	e 12 57	-3	23 19	-24	e 39.2	47.8
Pompeii	88.3	48	e 13 45	+38	e 22 45	-70	42.8	—
Apia	89.5	258	—	—	e 23 57	-12	35.0	—
Lemberg	91.3	38	20 15	?	—	—	e 45.2	56.8
Helwan	E. 105.1	53	18 45	?PR ₁	—	—	—	63.6
	N. 105.1	53	25 21	?S	(25 21)	-82	—	76.0
Cape Town	109.8	121	52 9	?L	—	—	(52.2)	58.6
Zi-ka-wei	127.3	330	—	—	—	—	e 64.0	—
Melbourne	129.4	232	—	—	—	—	64.0	67.2
Simla	131.6	20	e 22 3	?PR ₁	—	—	—	81.8
Taihoku	132.3	325	—	—	e 45 45	?	—	—
Manila	140.6	316	e 20 14	?PR ₁	—	—	—	—
Kodaikanal	150.3	34	89 33	?L	—	—	100.4	102.4
Colombo	154.4	34	36 45	?	—	—	—	—
Batavia	164.9	302	e 20 4	[-8]	—	—	97.2	—

Additional records: Cheltenham gives its East component as 20h. instead of 23h. Georgetown for Bosch Instrument gives $eL = +13.3m.$, $T_0 = 23h.14m.15s.$ Washington $L = +15.2m.$ Chicago $L = +15.8m.$ and +25.8m. An Arbor gives Bosch-Omori records and its Wiechert records in two components. Ithaca $ePN = +5m.56s.$, $eE = +13m.13s.$, $T_0 = 23h.13m.49s.$ Toronto $iS = +15m.27s.$, $i = +16m.9s.$, $iL = +20.6m.$, $T_0 = 23h.16m.12s.$ Northfield $L = +19.8m.$ Berkeley $MN = +23.7m.$ La Quiaca has been assumed to use mean time four hours west of Greenwich. Coimbra gives a set of Milne records in addition to its usual one. Also $PN = +12m.6s.$, $MN = +35.5m.$, $T_0 = 23h.14m.12s.$ San Fernando $MN = +44.8m.$ Uccle $PR_1 = +15m.15s.$, $T_0 = 23h.15m.6s.$ Apia gives its S as e_1 , also $e_2 = +29m.57s.$ De Bilt $eSR_1E = +27m.10s.$, $MN = +38.2m.$, $T_0 = 23h.14m.45s.$ Moncalieri $MN = +44.0m.$ Rocca di Papa $L = +45.6m.$ and +56.7m. Pompeii gives its records as at 0h. on the 30th. Kodaikanal probably records a separate shock.

June 29d. Records also at 0h. (Tucson, Ottawa, and Chicago), 1h. (Victoria and Toronto), 3h. (Florence and Rocca di Papa), 7h. (Pola, Florence, Pompeii, Zurich, and Rocca di Papa), 9h. (Rocca di Papa and Ascension), 10h. (Rocca di Papa and Ascension), 11h. (Rocca di Papa and Ascension), 13h. (Ascension (6)), 15h. (Zurich, Pompeii, Rocca di Papa (6), Pola, and Vienna), 16h. (Zurich (2), Hamburg, Vienna, and Rocca di Papa (4)), 17h. (Vienna, Pompeii, Zurich, Rocca di Papa (4), and Florence), 18h. (Rocca di Papa (3)), 19h. (Rocca di Papa and Pompeii), 20h. (Florence, Zurich, and Rocca di Papa), 21h. (Taihoku and Rocca di Papa), 22h. (Florence), 23h. (Rocca di Papa (3)).

June 30d. 7h. 23m. 40s. (I) ; Epicentre $6^\circ.0N. 37^\circ.0E.$
7h. 26m. 20s. (II) ;

$A = +.794$, $B = +.599$, $C = +.105$; $D = +.602$, $E = -.799$;
 $G = +.083$, $H = +.063$, $K = -.994$.

The position of the epicentre is unusual (see further note at end), and the supposition of a double shock is made with hesitation, though there seems to be good evidence in favour of it. Only Helwan and Rocca di Papa give double records, though other records may be interpreted in that sense.

Continued on next page.

The first shock was observed at the following stations:—

June 30d. 7h. 23m. 40s.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan	N.	24.4	348	5 50	+18	10 38	+50	—	14.4
Rocca di Papa		41.8	333	9 36	?PR ₁	—	—	—	—
Cape Town		43.7	200	—	—	—	—	21.2	—
Rio Tinto		50.7	315	9 20	+ 9	—	—	—	—
Coimbra		53.2	318	(9 21)	- 6	9 21	?P	23.6	38.7
Bidston		57.5	331	10 44	+48	—	—	—	34.8

Cape Town records the above L as P, followed by the L for second shock as S.
Coimbra records P at 7h.23m.35s. (which must belong to yet another shock);
S at 7h.33m.1s. (taken above as P), and L as above recorded, MN = +34.6m.

June 30d. 7h. 26m. 20s. Epicentre 6°·0N. 37°·0E.

A = +.794, B = +.599, C = +.105; D = +.602, E = -.799;
G = +.083, H = +.063, K = -.994.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan	E.	24.4	348	5 16	-16	10 28	+36	—	13.9
Athens		34.1	341	7 10	+ 4	—	—	19.2	21.4
Bombay		37.2	65	—	—	13 14	-13	—	22.0
Pompeii		40.1	334	7 40	-16	15 40	+92	25.7	—
Kodaikanal		40.2	81	14 28	?S	(14 28)	+18	21.6	26.3
Rocca di Papa		41.8	333	8 2	- 7	(14 26)	- 6	e 25.0	33.0
Colombo		42.5	88	—	—	13 40?	-62	22.7	27.7
Algiers		43.7	320	—	—	—	—	22.7	25.7
Cape Town		43.7	200	—	—	21 16	?L	22.6	25.6
Pola		43.7	336	15 21	?S	(15 21)	+23	e 25.3	34.8
Florence		44.0	331	7 40	-46	—	—	—	23.7
Lemberg		45.1	350	—	—	—	—	e 22.8	41.1
Simla		45.2	50	e 15 10	?S	(e 15 10)	- 8	—	24.1
Vienna		45.7	341	8 45	+ 7	—	—	25.2	41.7
Moncalieri		46.5	330	8 38	- 6	19 18	+22	26.6	28.9
Marseilles		46.5	328	—	—	—	—	28.7	—
Barcelona		47.1	324	—	—	(15 58)	+16	16.0	27.0
Tortosa		47.7	322	9 1	+ 9	—	—	24.7	27.1
Strasbourg		49.3	335	—	—	(15 40)	-30	15.7	—
San Fernando		49.8	314	9 16	+10	17 40	+84	29.7	33.6
Rio Tinto		50.7	315	—	—	—	—	—	30.7
Paris		51.8	331	—	—	e 16 40	- 1	28.7	30.7
Hamburg		52.4	340	9 42	+20	—	—	25.7	43.1
Uccle		52.4	334	—	—	20 40	?SR ₁	—	36.7
De Bilt		53.0	337	—	—	(17 40)	+44	17.7	37.8
Kew		54.9	332	21 40	?SR ₁	—	—	—	36.7
Oxford		55.6	331	—	—	17 47	+18	—	39.5
Eskdalemuir		58.8	335	—	—	—	—	33.7	—
Batavia		70.7	98	e 11 30	+ 9	20 48	+14	37.0	39.8
Manila		82.6	77	e 12 47	+13	—	—	—	—
Ottawa		101.3	320	e 22 10	?	e 24 58	-70	e 48.7	—
Ithaca		102.8	317	—	—	—	—	61.8	—
La Quiaca		104.1	249	—	—	—	—	—	85.2
Toronto		104.3	319	—	—	—	—	e 56.2	78.9
Andalgala		104.6	241	—	—	—	—	—	76.5
Cipolletti		105.6	230	56 46	?L	—	—	65.8	73.6
La Paz		106.2	255	—	—	28 54	+120	56.1	65.1
Melbourne		107.8	127	—	—	—	—	e 51.7	65.2
Chicago		110.6	320	24 23	?S	28 58	-85	e 56.7	—
Victoria		122.9	345	—	—	—	—	—	77.7
Honolulu		148.9	28	e 76 40	?L	—	—	e 102.2	108.7

Athens MN = +20.4m. Cape Town records above L as S and former L as P.
Pola MN = +33.5m. Moncalieri MN = +30.0m. San Fernando MN =
+33.1m. Paris S is given as e₁ and e₂ = +20m.40s. (whole minutes recorded
only). Hamburg MN = +34.3m. De Bilt MN = +35.5m. Ottawa
L = +93.7m. Chicago. The record of L follows that of the following
shock. Another L at 8h.32m.0s. = +65.7m. Toronto gives also another
L = +66.5m.

NOTE.—It is remarked above that the position of the epicentre is unusual.
The only previous record (in this series of publications) in that neighbourhood
is that of 1915 May 21d. 4h. 18m. 44s., epicentre 4°·0N. 32°·0E. To test
whether the above position (6°·0N. 37°·0E.) might possibly suit the records

Note continued on next page.

of 1915 May 21d., a fresh discussion of the May residuals was undertaken, with the result that the epicentre was found to be sensibly different from that of 1919. A small change was, however, indicated in the elements for 1915 May 21, and the new reduction stands as below for those stations, giving fair observations of P and S. The former residuals are added for comparison.

New reduction of 1915 May 21d. 4h. 18m. 53s., with new epicentre $5^{\circ}4'N$. $32^{\circ}0'E$.

$$A = +.844, B = +.528, C = +.092.$$

	New Δ	Former Az.	New Resids. P. s.	S. s.	Former Resids. P. s.	S. s.
Tiflis	38.0	15	+ 3	- 1	0	-12
Rocca di Papa	40.2	338	-17	—	-11	—
Cape Town	41.3	198	—	+42	—	+69
Padova	43.7	340	- 5	-10	- 5	-18
Granada	45.4	320	- 5	- 3	- 3	- 8
San Fernando	46.8	318	—	-31	—	-27
Rio Tinto	47.8	319	-46	—	-43	—
Paris	50.0	335	- 3	+ 2	- 2	- 5
Newport (I.W.)	53.1	335	- 3	+10	—	+ 2
Pulkovo	54.5	359	- 1	+ 2	- 1	- 5
Ekaterinburg	56.1	18	+ 1	+ 4	+ 1	- 5
Eskdalemuir	57.3	337	+ 3	+ 2	+ 3	- 5
Edinburgh	57.8	338	+ 9	—	+10	—
Irkutsk	74.9	37	+ 4	(+97)	+ 6	(+94)
Batavia	75.6	97	+ 9	+ 7	+20	+19

On the other hand this revised epicentre for 1915 May 21 will clearly not suit 1919 June 30. By way of illustration we may give the (very few) cases of good observations at the same station.

	1919 June 30.		1915 May 21.		Diff.	
	P. m. s.	S. m. s.	P. m. s.	S. m. s.	P. s.	S. s.
Rocca di Papa	8 2	—	7 40	—	-22	—
Paris	—	16 40	—	16 21	—	-19
Batavia	11 30	20 49	12 2	21 40	+32	+51

June 30d. 23h. 50m. 40s. Epicentre $43^{\circ}8'N$. $11^{\circ}2'E$. (as on 1919 June 29d.).

$$A = +.708, B = +.140, C = +.692; \quad D = +.194, E = -.981; \\ G = +.679, H = +.134, K = -.722.$$

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Florence	0.0	—	1 15	+75	—	—	—	1.4
Pola	2.2	61	e 0 35	+ 1	—	—	e 1.1	1.4
Rocca di Papa	2.3	152	i 0 54	?S	(i 0 54)	- 9	(1.4)	1.7
Moncalieri	2.8	295	e 1 19	?S	(e 1 19)	+ 2	1.9	—
Pompeii	3.9	142	i 2 26	?L	—	—	3.7	—
Zurich	4.0	332	e 1 14	+12	2 17?	+27	(2.3)	—
Vienna	5.7	37	e 1 41	+13	2 29	- 7	3.0	3.6
De Bilt	9.2	336	—	—	—	—	e 5.4	—
Hamburg	9.8	356	—	—	—	—	e 5.3	—

Additional records: Pola gives MN = +1.2m. Zurich ePN = +1m.15s., ePZ = +1m.16s., ePE = +1m.27s.

June 30d. Records also at 1h. (Rocca di Papa), 4h. (Apia and Manila), 5h. (Rocca di Papa, Zurich, Vienna, Florence, and Kodaikanal), 12h. (Helwan), 13h. (Manila and Moncalieri), 14h. (Helwan, Rocca di Papa, Pompeii, and Vienna), 16h. (Rocca di Papa (2) and Moncalieri), 20h. (Florence), 21h. (Manila and San Fernando).

EXPANDED TABLES FOR P & S, 90°—130°
(in continuation of those already issued separately).

Δ	P			S	Δ	P			S	Δ	P			S	Δ	P			S
°	m.	s.	m.	s.	°	m.	s.	m.	s.	°	m.	s.	m.	s.	°	m.	s.	m.	s.
90.0	13	16	24	14	95.0	13	43	25	6	100.0	14	11	25	56	105.0	14	34	26	42
0.1	13	17	24	15	95.1	13	44	25	7	100.1	14	11	25	57	105.1	14	35	26	43
0.2	13	17	24	16	95.2	13	44	25	8	100.2	14	12	25	58	105.2	14	35	26	44
0.3	13	18	24	17	95.3	13	45	25	9	100.3	14	12	25	59	105.3	14	36	26	45
0.4	13	18	24	18	95.4	13	45	25	10	100.4	14	13	26	0	105.4	14	36	26	46
0.5	13	19	24	19	95.5	13	46	25	11	100.5	14	13	26	1	105.5	14	37	26	47
0.6	13	19	24	20	95.6	13	47	25	12	100.6	14	13	26	1	105.6	14	37	26	48
0.7	13	20	24	21	95.7	13	47	25	13	100.7	14	14	26	2	105.7	14	38	26	49
0.8	13	20	24	22	95.8	13	48	25	14	100.8	14	14	26	3	105.8	14	38	26	50
0.9	13	21	24	23	95.9	13	48	25	15	100.9	14	15	26	4	105.9	14	39	26	51
1.0	13	21	24	24	96.0	13	49	25	16	101.0	14	15	26	5	106.0	14	39	26	52
1.1	13	22	24	25	96.1	13	50	25	17	101.1	14	16	26	6	106.1	14	40	26	53
1.2	13	22	24	26	96.2	13	50	25	18	101.2	14	16	26	7	106.2	14	40	26	54
1.3	13	23	24	27	96.3	13	51	25	19	101.3	14	17	26	8	106.3	14	41	26	55
1.4	13	23	24	28	96.4	13	51	25	20	101.4	14	17	26	9	106.4	14	41	26	56
1.5	13	24	24	29	96.5	13	52	25	21	101.5	14	18	26	10	106.5	14	42	26	57
1.6	13	25	24	31	96.6	13	52	25	22	101.6	14	18	26	11	106.6	14	42	26	57
1.7	13	25	24	32	96.7	13	53	25	23	101.7	14	19	26	12	106.7	14	43	26	58
1.8	13	26	24	33	96.8	13	53	25	24	101.8	14	19	26	13	106.8	14	43	26	59
1.9	13	26	24	34	96.9	13	54	25	25	101.9	14	20	26	14	106.9	14	44	27	0
2.0	13	27	24	35	97.0	13	54	25	26	102.0	14	20	26	15	107.0	14	44	27	1
2.1	13	28	24	36	97.1	13	55	25	27	102.1	14	21	26	16	107.1	14	44	27	2
2.2	13	28	24	37	97.2	13	55	25	28	102.2	14	21	26	17	107.2	14	45	27	3
2.3	13	29	24	38	97.3	13	56	25	29	102.3	14	22	26	18	107.3	14	45	27	4
2.4	13	29	24	39	97.4	13	56	25	30	102.4	14	22	26	19	107.4	14	46	27	5
2.5	13	30	24	40	97.5	13	57	25	31	102.5	14	23	26	20	107.5	14	46	27	6
2.6	13	30	24	41	97.6	13	58	25	32	102.6	14	23	26	20	107.6	14	46	27	6
2.7	13	31	24	42	97.7	13	58	25	33	102.7	14	24	26	21	107.7	14	47	27	7
2.8	13	31	24	43	97.8	13	59	25	34	102.8	14	24	26	22	107.8	14	47	27	8
2.9	13	32	24	44	97.9	13	59	25	35	102.9	14	25	26	23	107.9	14	48	27	9
3.0	13	32	24	45	98.0	14	0	25	36	103.0	14	25	26	24	108.0	14	48	27	10
3.1	13	33	24	46	98.1	14	1	25	37	103.1	14	26	26	25	108.1	14	49	27	11
3.2	13	33	24	47	98.2	14	1	25	38	103.2	14	26	26	26	108.2	14	49	27	12
3.3	13	34	24	48	98.3	14	2	25	39	103.3	14	27	26	27	108.3	14	50	27	13
3.4	13	34	24	49	98.4	14	2	25	40	103.4	14	27	26	28	108.4	14	50	27	14
3.5	13	35	24	51	98.5	14	3	25	41	103.5	14	28	26	29	108.5	14	51	27	15
3.6	13	36	24	52	98.6	14	3	25	42	103.6	14	28	26	29	108.6	14	51	27	15
3.7	13	36	24	53	98.7	14	4	25	43	103.7	14	29	26	30	108.7	14	52	27	16
3.8	13	37	24	54	98.8	14	4	25	44	103.8	14	29	26	31	108.8	14	52	27	17
3.9	13	37	24	55	98.9	14	5	25	45	103.9	14	30	26	32	108.9	14	53	27	18
4.0	13	38	24	56	99.0	14	5	25	46	104.0	14	30	26	33	109.0	14	53	27	19
4.1	13	39	24	57	99.1	14	6	25	47	104.1	14	30	26	34	109.1	14	53	27	20
4.2	13	39	24	58	99.2	14	6	25	48	104.2	14	31	26	35	109.2	14	54	27	21
4.3	13	40	24	59	99.3	14	7	25	49	104.3	14	31	26	36	109.3	14	54	27	22
4.4	13	40	25	0	99.4	14	7	25	50	104.4	14	32	26	37	109.4	14	55	27	23
4.5	13	41	25	1	99.5	14	8	25	51	104.5	14	32	26	38	109.5	14	55	27	24
4.6	13	41	25	2	99.6	14	9	25	52	104.6	14	32	26	38	109.6	14	55	27	24
4.7	13	42	25	3	99.7	14	9	25	53	104.7	14	33	26	39	109.7	14	56	27	25
4.8	13	42	25	4	99.8	14	10	25	54	104.8	14	33	26	40	109.8	14	56	27	26
4.9	13	43	25	5	99.9	14	10	25	55	104.9	14	34	26	41	109.9	14	57	27	27

EXPANDED TABLES FOR P & S

(in continuation of those already issued separately).

Δ	P		S		Δ	P		S		Δ	P		S		Δ	P		S	
Δ	m.	s.	m.	s.	Δ	m.	s.	m.	s.	Δ	m.	s.	m.	s.	Δ	m.	s.	m.	s.
110-0	14	57	27	28	115-0	15	20	28	10	120-0	15	42	28	49	125-0	16	6	29	26
110-1	14	58	27	29	115-1	15	21	28	11	120-1	15	43	28	50	125-1	16	6	29	27
110-2	14	58	27	30	115-2	15	21	28	12	120-2	15	43	28	51	125-2	16	7	29	27
110-3	14	59	27	31	115-3	15	22	28	12	120-3	15	44	28	51	125-3	16	7	29	28
110-4	14	59	27	32	115-4	15	22	28	13	120-4	15	44	28	52	125-4	16	8	29	29
110-5	15	0	27	33	115-5	15	23	28	14	120-5	15	45	28	53	125-5	16	8	29	30
110-6	15	0	27	33	115-6	15	23	28	15	120-6	15	45	28	54	125-6	16	8	29	30
110-7	15	1	27	34	115-7	15	24	28	16	120-7	15	46	28	55	125-7	16	9	29	31
110-8	15	1	27	35	115-8	15	24	28	16	120-8	15	46	28	55	125-8	16	9	29	32
110-9	15	2	27	36	115-9	15	25	28	17	120-9	15	47	28	56	125-9	16	10	29	32
111-0	15	2	27	37	116-0	15	25	28	18	121-0	15	47	28	57	126-0	16	10	29	33
111-1	15	3	27	38	116-1	15	25	28	19	121-1	15	48	28	58	126-1	16	10	29	34
111-2	15	3	27	39	116-2	15	26	28	20	121-2	15	48	28	58	126-2	16	11	29	34
111-3	15	4	27	40	116-3	15	26	28	20	121-3	15	49	28	59	126-3	16	11	29	35
111-4	15	4	27	41	116-4	15	27	28	21	121-4	15	49	29	0	126-4	16	12	29	36
111-5	15	5	27	42	116-5	15	27	28	22	121-5	15	50	29	1	126-5	16	12	29	37
111-6	15	5	27	42	116-6	15	27	28	23	121-6	15	50	29	1	126-6	16	12	29	37
111-7	15	6	27	43	116-7	15	28	28	24	121-7	15	51	29	2	126-7	16	13	29	38
111-8	15	6	27	44	116-8	15	28	28	24	121-8	15	51	29	3	126-8	16	13	29	39
111-9	15	7	27	45	116-9	15	29	28	25	121-9	15	52	29	3	126-9	16	14	29	39
112-0	15	7	27	46	117-0	15	29	28	26	122-0	15	52	29	4	127-0	16	14	29	40
112-1	15	7	27	47	117-1	15	30	28	27	122-1	15	53	29	5	127-1	16	14	29	41
112-2	15	8	27	48	117-2	15	30	28	28	122-2	15	53	29	6	127-2	16	15	29	41
112-3	15	8	27	48	117-3	15	31	28	28	122-3	15	54	29	6	127-3	16	15	29	42
112-4	15	9	27	49	117-4	15	31	28	29	122-4	15	54	29	7	127-4	16	16	29	43
112-5	15	9	27	50	117-5	15	32	28	30	122-5	15	55	29	8	127-5	16	16	29	44
112-6	15	9	27	51	117-6	15	32	28	31	122-6	15	55	29	9	127-6	16	16	29	44
112-7	15	10	27	52	117-7	15	33	28	32	122-7	15	56	29	10	127-7	16	17	29	45
112-8	15	10	27	52	117-8	15	33	28	32	122-8	15	56	29	10	127-8	16	17	29	46
112-9	15	11	27	53	117-9	15	34	28	33	122-9	15	57	29	11	127-9	16	18	29	46
113-0	15	11	27	54	118-0	15	34	28	34	123-0	15	57	29	12	128-0	16	18	29	47
113-1	15	12	27	55	118-1	15	34	28	35	123-1	15	57	29	13	128-1	16	19	29	48
113-2	15	12	27	56	118-2	15	35	28	36	123-2	15	58	29	13	128-2	16	19	29	48
113-3	15	13	27	56	118-3	15	35	28	36	123-3	15	58	29	14	128-3	16	20	29	49
113-4	15	13	27	57	118-4	15	36	28	37	123-4	15	59	29	15	128-4	16	20	29	50
113-5	15	14	27	58	118-5	15	36	28	38	123-5	15	59	29	16	128-5	16	21	29	51
113-6	15	14	27	59	118-6	15	36	28	39	123-6	15	59	29	16	128-6	16	21	29	51
113-7	15	15	28	0	118-7	15	37	28	40	123-7	16	0	29	17	128-7	16	22	29	52
113-8	15	15	28	0	118-8	15	37	28	40	123-8	16	0	29	18	128-8	16	22	29	53
113-9	15	16	28	1	118-9	15	38	28	41	123-9	16	1	29	18	128-9	16	23	29	53
114-0	15	16	28	2	119-0	15	38	28	42	124-0	16	1	29	19	129-0	16	23	29	54
114-1	15	16	28	3	119-1	15	38	28	43	124-1	16	2	29	20	129-1	16	24	29	55
114-2	15	17	28	4	119-2	15	39	28	43	124-2	16	2	29	20	129-2	16	24	29	55
114-3	15	17	28	4	119-3	15	39	28	44	124-3	16	3	29	21	129-3	16	25	29	56
114-4	15	18	28	5	119-4	15	40	28	45	124-4	16	3	29	22	129-4	16	25	29	57
114-5	15	18	28	6	119-5	15	40	28	46	124-5	16	4	29	23	129-5	16	26	29	58
114-6	15	18	28	7	119-6	15	40	28	46	124-6	16	4	29	23	129-6	16	26	29	58
114-7	15	19	28	8	119-7	15	41	28	47	124-7	16	5	29	24	129-7	16	27	29	59
114-8	15	19	28	8	119-8	15	41	28	48	124-8	16	5	29	25	129-8	16	27	30	0
114-9	15	20	28	9	119-9	15	42	28	48	124-9	16	6	29	25	129-9	16	28	30	0

The International Seismological Summary for 1919 July, August, September.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

Attention may be called to the cases of deep focus on August 18d. 16h. 55m. 25s. and August 18d. 20h. 52m. 0s., when a focal depth 0·050 radius has been assumed as for the same epicentre (17°·0S. 177°·5W.) on 1918 May 22, though a smaller value would fit the present records rather better: and on August 31d. 17h.20m.34s., when a focal depth 0·015 radius is ventured.

Between the two shocks on August 18, presumably from the same focus, we have an interval of 236·6m. = $11 \times 21\text{m.} + 5\cdot6\text{m.}$. The case for a periodicity of 21m. is on its trial, and all pieces of evidence may be of value. The Helwan Observatory gives a number of records to which nothing corresponds elsewhere, and which may therefore be local shocks. It seems worth while to test them for the existence of a 21-minute periodicity, and the following comparison was made for the month of September, during which such records were numerous. The first date being taken as zero-point, multiples of 21·0min. indicated by the column N were subtracted from the records to form the column O—C. Brackets indicate cases where the mean of two instrumental records was taken; there seems no good reason for excluding these cases. If we collect the values of O—C. for each minute of the 21 we find that the cycle divides itself readily into two parts, of which one has 29 records in 11 minutes or 2·7 per minute, as follows :—

O—C.	—1	—2	—3	—4	—5	—6	—7	—8	—9	—10	+10
No.	2	2	5	2	1	2	5	4	1	2	3

and the other has 44 records in 10 minutes or 4·4 per minute, as follows :—

O—C.	0	+1	+2	+3	+4	+5	+6	+7	+8	+9
No.	6	6	5	0	3	5	5	3	4	7

This suggests further inquiry, which shall be made.

HELWAN RECORDS IN SEPTEMBER, 1919.

Date.			N.	O - C.	Date.			N.	O - C.
d.	h.	m.			d.	h.	m.		
1	13	52	0	0	16	0	9	989	+ 8
1	14	(52)	3	(- 3)	16	12	(42)	1025	(+ 5)
2	9	17	55	+10	17	9	38	1085	+ 1
2	14	6	69	+ 5	18	5	52	1143	- 3
3	10	(33)	128	(- 7)	18	7	59	1149	- 2
3	11	(31)	130	(+ 9)	18	11	6	1158	- 4
3	18	(24)	150	(+ 2)	18	16	46	1174	0
5	8	(16)	258	(+ 6)	18	21	6	1186	+ 8
5	15	(36)	279	(+ 5)	19	0	28	1196	0
5	17	(50)	286	(- 8)	19	4	31	1208	- 9
5	19	58	292	- 6	19	5	42	1211	- 1
6	9	54	332	-10	19	8	42	1220	-10
6	15	(19)	347	(0)	19	12	(44)	1231	(+ 1)
7	21	(43)	434	(- 3)	19	16	(48)	1243	(- 7)
8	4	(46)	454	(0)	20	10	(18)	1293	(- 7)
10	11	2	609	÷ 1	21	12	47	1368	+ 7
10	12	10	612	+ 6	21	21	56	1394	+10
10	14	53	620	+ 1	22	5	4	1415	- 3
11	14	(42)	688	(+ 2)	23	0	11	1469	+10
12	6	(50)	734	(+ 4)	23	2	41	1477	- 8
12	13	(55)	754	(+ 9)	23	4	0	1480	+ 8
12	19	2	769	+ 1	23	21	56	1532	- 8
12	21	3	775	- 4	24	2	22	1544	+ 6
13	11	22	816	- 6	25	10	54	1637	+ 5
13	16	9	829	+ 8	25	16	47	1654	+ 1
13	18	(26)	836	(- 2)	26	7	51	1697	+ 2
13	22	45	848	+ 5	26	9	27	1702	- 7
14	4	25	864	+ 9	27	1	49	1748	+ 9
14	13	(21)	890	(- 1)	27	4	9	1755	+ 2
14	15	(20)	896	(- 8)	27	7	41	1765	+ 4
15	4	(34)	933	(+ 9)	27	9	50	1771	+ 7
15	6	14	938	+ 4	29	12	16	1915	+ 9
15	11	(4)	952	(0)	30	2	58	1957	+ 9
15	13	3	958	- 7	30	4	40	1962	+ 6
15	18	1	972	- 3	30	9	35	1976	+ 7
15	22	32	985	- 5	30	15	10	1992	+ 6
					30	17	(12)	1998	(+ 2)

A case of mean alignment of several epicentres is noticed on August 29d. 5h.

H. H. TURNER.

University Observatory, Oxford,
1924 April 7.

1919 JULY, AUGUST, SEPTEMBER.

July 1d. 3h. 34m. 30s. Epicentre $43^{\circ}8'N$. $11^{\circ}2'E$. (Florence), (as on 1919 June 30d.).

A = +.708, B = +.140, C = +.692; D = +.194, E = -.981;
G = +.679, H = +.134, K = -.722.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 0	0	—	—	—	0.2
Pola	2.2	61	e 0 11	-23	(0 43)	-17	0.7	2.3
Rocca di Papa	2.3	152	e 0 42	+ 6	1 9	+ 6	—	1.4
Milan	2.3	320	1 32	?L	—	—	(1.5)	1.9
Moncalieri	2.8	295	0 47	+ 3	1 29	+12	2.0	—
Pompeii	3.9	142	e 1 41	+40	—	—	2.5	—
Zurich	4.0	332	0 56	- 6	2 6	+16	—	2.5
Strasbourg	5.3	334	e 1 34	+12	e 2 24	- 1	—	—
Vienna	5.7	37	e 1 2	-26	2 3	-33	2.7	3.2
De Bilt	9.2	336	e 4 54	?L	—	—	e 5.3	—
Hamburg	9.8	356	—	—	—	—	e 4.5	—

Additional records: Zurich gives ePE = +0m.55s., MN = +2.2m., iZ = +2m.14s. Pola MN = +2.7m.

July 1d. 21h. 30m. 25s. Epicentre $14^{\circ}5'N$. $91^{\circ}0'W$. (as on 1919 April 28d.).

A = -.017, B = -.968, C = +.250; D = -1.000, E = +.018;
G = -.004, H = -.250, K = -.968.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Georgetown	27.3	24	e 6 2	+ 1	—	—	e 19.1	—
Chicago	27.4	6	6 1	- 1	10 43	- 5	13.4	—
Toronto	30.8	17	—	—	—	—	18.5	—
Ottawa	33.5	20	e 7 10	+ 9	i 12 51	+19	e 22.2	—
Bidston	77.2	38	e 12 23	+21	—	—	—	23.6
De Bilt	82.5	38	—	—	e 23 38	+46	e 53.6	54.3

Additional records: Georgetown gives eLN = +19.2m. Ottawa L = +23.8m. De Bilt records S at 22h.8m.43s., which has been taken as applicable to the following shock.

July 1d. 21h. 49m. 36s. At $50^{\circ}0'N$. $128^{\circ}0'W$. (as on 1917 Dec. 23d.15h.).

A = -.396, B = -.507, C = +.767.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Victoria	3.4	0 53	0	—	—	—	2.4
Tucson	E. 21.8	5 46	+43	—	—	7.7	7.9
De Bilt	70.5	—	—	19 7	-85	34.4	49.9

Possibly repeated at 22h.4m.22s., for which Victoria gives P = +0m.53s., L = +1.9m., M = +2.9m. Tucson PN = +5m.40s.

July 1d. Records also at 2h. (Manila and Apia), 4h. and 13h. (Rocca di Papa), 17h. (Chicago), 22h. (San Fernando and Lick), 23h. (Helwan).

July 2d. 7h. 21m. 10s. Epicentre $34^{\circ}0'N$. $131^{\circ}0'E$.

A = -.544, B = +.626, C = +.559; D = +.755, E = +.656;
G = -.367, H = +.422, K = -.829.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Kobe	3.5	83	1 0	+ 5	(1 41)	+ 4	1.7	1.8
Osaka	3.8	83	1 9	+10	(1 50)	+ 6	1.8	3.2
Zi-ka-wei	8.5	254	e 2 8	- 1	—	—	—	—
Victoria	74.4	42	—	—	—	—	64.0	—
Chicago	96.4	28	—	—	e 47 8	?L	e 52.8	—
Ottawa	97.1	18	e 32 50	?SR	e 48 20	?L	e 52.8	—
Toronto	97.5	21	—	—	—	—	40.4	—

Additional records: Osaka gives MN = +3.3m. Chicago L = +54.8m. Ottawa L = +56.8m. and +68.8m.

July 2d. Records also at 0h. (Pompei), 2h. (Mizusawa, De Bilt, and Helwan), 7h. (San Fernando), 10h. (Taihoku and Zi-ka-wei—separate shocks), 11h. (Vienna), 14h. (Apia), 15h. and 16h. (Colombo), 18h. (Azores), 22h. (San Fernando, Barcelona, De Bilt, Manila), 23h. (Lick, De Bilt, Helwan, and San Fernando).

July 3d. Records at 1h. (Batavia (2)), 2h. (Colombo and Manila), 4h. (San Fernando and Florence), 5h. (Bidston), 7h. (Manila and Batavia), 14h. (Colombo), 15h. (Rocca di Papa), 16h. (De Bilt), 17h. (Zurich), 22h. (San Fernando and Lick), 23h. (Manila and Riverview).

July 4d. 13h. 29m. 20s. Epicentre $7^{\circ}48.35^{\circ}9E$.

$$A = +.803, B = +.582, C = -.129; \quad D = +.586, E = -.810; \\ G = -.104, H = -.076, K = -.992.$$

It is assumed that this is an anticipation of the shock on July 8d. 21h., as no better alternative was found, after much searching.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Cape Town	31.0	209	23 52	?L	—	—	(23.9)	27.5
Helwan E.	37.5	355	-10 32	?	—	—	—	15.1
N.	37.5	355	-10 14	?	—	—	—	19.3
Kodaikanal E.	45.0	69	22 16	?L	—	—	23.6	26.5
Rocca di Papa	53.6	340	e 11 10	+100	e 19 15	+131	e 26.5	34.1
Barcelona	57.8	331	—	—	—	—	e 25.5	28.4
Lemberg	58.2	352	—	—	e 16 46	-75	—	23.9
Moncalieri	58.2	339	e 10 4	+ 4	20 2	+121	28.7	30.0
San Fernando	59.0	322	27 58	?L	—	—	(28.0)	34.7
Rio Tinto	60.1	323	24 40	?L	—	—	—	32.2
Strasbourg	61.2	340	e 9 40	-40	—	—	—	—
Coimbra	62.8	324	20 40	?S	(20 40)	+102	29.7	31.2
Paris	63.4	338	—	—	—	—	e 30.7	—
Hamburg	64.8	345	e 10 40	- 4	—	—	e 34.7	41.9
De Bilt	65.1	341	10 48	+ 2	—	—	e 32.7	40.2
Oxford	67.2	337	11 6	+ 7	19 11	-41	—	39.9
Eskdalemuir	70.6	339	—	—	—	—	34.2	—
Edinburgh	71.1	339	11 32	+ 8	19 46	-53	28.7	36.4
Washington	112.5	310	—	—	—	—	e 57.0	—

The Helwan records must refer to another shock.

Additional records: Moncalieri gives MN = +30.1m.
+35.5m. De Bilt MN = +34.8m.

Hamburg MN =

July 4d. Records also at 0h. (Manila), 1h. (close to Manila), 7h. (near San Fernando), 8h. (Chicago), 9h. (Paris and Manila), 11h. (Tokyo), 12h. (near Batavia), 13h. (Kodaikanal), 16h. (close to Batavia), 18h. (Manila), 21h. (La Paz), 22h. (Batavia, close to La Paz), 23h. (Edinburgh, De Bilt, Rocca di Papa, Eskdalemuir, Moncalieri, Kew, Helwan, Hamburg, and close to La Paz.).

July 5d. Records at 2h. (Helwan, De Bilt, and Edinburgh), 3h. (Simla, Hamburg, and De Bilt), 6h. (Helwan), 7h. (close to La Paz), 9h. (Apia), 13h. (San Fernando).

1919. July 6d. 7h. 4m. 10s. Epicentre $14^{\circ}5N. 91^{\circ}0W$.

(as on 1d.).

$$A = -.017, B = -.968, C = +.250; \quad D = -1.000, E = +.018; \\ G = -.004, H = -.250, K = -.968.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Vieques E.	24.8	78	8 55	?S	(8 55)	-64	14.1	—
N.	24.8	78	—	—	—	—	12.1	12.4
Tucson N.	25.4	318	5 12	-30	9 23	-48	12.5	—
Washington	27.3	24	5 50	-11	11 10	+24	15.3	—
Georgetown E.	27.3	24	e 6 5	+ 4	11 25	+39	e 14.4	—
N.	27.3	24	e 5 55	- 6	11 25	+39	—	—
Z.	27.3	24	e 5 54	- 7	11 25	+39	—	—
Cheltenham E.	27.3	25	6 5	+ 4	11 7	+21	16.7	17.2
N.	27.3	25	6 20	+19	10 50	+ 4	16.8	18.3

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Chicago	27.4	6	5 45	-17	i 10 50	+ 2	14.0	—
Ann Arbor	E. 28.5	12	—	—	11 32	+24	—	16.8
	N. 28.5	12	6 32	+19	11 44	+36	15.1	15.8
Ithaca	N. 30.7	23	e 7 2	+27	e 12 15	+29	16.3	—
Toronto	30.8	17	6 50	+14	11 26	-22	e 13.4	19.7
Northfield	31.0	25	e 8 0	+82	—	—	14.3	—
Ottawa	33.5	20	6 44	-17	11 58	-34	e 15.2	—
Berkeley	36.2	316	—	—	e 11 35	-98	—	—
La Paz	38.3	143	i 7 56	+16	i 14 2	+20	17.9	20.5
Victoria	43.1	329	11 43	?	15 1	+12	20.6	24.6
Honolulu	63.7	287	e 11 8	+32	19 20	+11	29.2	31.3
Eskdalemuir	76.8	36	12 0	0	21 46	- 1	37.6	e 41.4
Edinburgh	76.8	35	12 2	+ 2	21 44	- 3	35.8	43.6
Bidston	77.2	38	(12 50)	+48	12 50	?P	—	44.0
Paris	81.4	42	e 12 30	+ 3	e 22 33	- 6	40.8	42.8
Uccle	82.2	40	e 12 31	0	e 22 44	- 4	e 35.8	—
De Bilt	82.5	38	12 34	+ 1	22 46	- 6	e 38.8	43.2
Barcelona	82.8	49	—	—	—	—	39.5	44.3
Algiers	84.6	53	e 12 20	-26	23 8	- 7	39.8	44.3
Hamburg	84.7	37	i 12 48	- 2	i 23 3	-13	e 39.8	44.8
Strasbourg	84.9	41	e 12 50	- 3	e 22 50	-28	33.8	—
Moncalieri	85.8	45	e 12 52	0	23 9	-19	44.2	—
Rocca di Papa	90.3	47	12 38	-40	—	—	—	—

NOTES TO JULY 6d. 7h. 4m. 10s.

Determinations of T_0 -7h.

	m. s.		m. s.
Georgetown	3 9	Eskdalemuir	4 23
Ottawa	4 17	Paris	4 34
Toronto	5 30	Uccle	4 24
Ann Arbor	4 6	De Bilt	4 30
Ithaca	4 37	Hamburg	4 41
La Paz	4 23	Moncalieri	4 43

Additional records: Ottawa L = +20.8m. and +40.8m. T_0 = 7h.4m.7s.
 Edinburgh PR₁ = +15m.20s. Paris iS = +22m.40s., T_0 = 7h.4m.34s.
 De Bilt MN = +58.8m., T_0 = 7h.4m.30s. Barcelona MN = +46.9m.
 La Paz P = +18m.12s. (a second shock ?) T = 7h.4m.25s.

July 6d. 19h. 29m. 3s. At 11°-5S. 64°-0W.

$$A = +.430, B = -.881, C = -.199.$$

The epicentre 18°-5S. 63°-5W. of 1918 Aug. 17d. does not fit the De Bilt S, though it would accord with L.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	6.4	1 39	+1	2 54	-1	3.6	4.8
De Bilt	E. 86.7	—	—	e 23 39	+1	e 45.0	48.7

De Bilt gives MN = +51.0m.

July 6d. Records also at 3h. (La Paz), 7h. (close to Cipolletti), 9h. (La Paz), 13h. (Bidston), 14h. (Eskdalemuir), 18h. (Melbourne), 20h. (Helwan), 22h. (San Fernando).

July 7d. 13h. 55m. 0s. Epicentre 2°-0S. 137°-0E. (as on 1916 Jan. 13d. 6h.).

$$A = -.731, B = +.689, C = -.035; \quad D = +.682, E = +.731; \\ G = +.026, H = -.024, K = -.999.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	23.0	317	e 4 55	-22	—	—	—	—
Batavia	30.4	261	e 6 37	+ 5	—	—	—	—
Riverview	34.5	159	e 2 12	?	e 7 3	?P	10.7	12.3
Melbourne	36.5	169	8 30	+64	12 48	-29	14.5	16.4
Honolulu	67.7	64	e 14 12	?PR ₁	e 20 18	+20	e 24.0	32.1
Mauritius	79.1	250	42 24	?L	—	—	(42.4)	45.8
Victoria	98.0	42	26 47	?S	(26 47)	+71	40.3	48.8
Helwan	104.5	300	29 0	?S	(29 0)	+142	—	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
De Bilt	E.	116.0	320	e 19 31	?PR ₁	—	—	e 57.0	70.7
	N.	116.0	320	—	—	—	—	e 61.0	67.4
Bidston		113.7	334	55 24	?L	—	—	(55.4)	66.5
Chicago		123.7	39	—	—	—	—	e 52.0	—
Toronto		127.3	33	—	—	—	—	62.5	69.9
Ottawa		128.0	29	—	—	—	—	e 55.0	—
Georgetown		131.8	35	—	—	—	—	e 53.0	—
La Paz		140.9	127	19 19 [-22]	—	—	—	—	—

Additional records : Riverview gives PR₁ = +3m.26s., SR₁ = +9m.3s.,
 MN = +17.8m. Helwan PN = +31m.0s. Chicago M = +55.0m. and
 +61.0m. Toronto eL = +65.9m.

July 7d. Records also at 3h. (close to Mizusawa), 17h. (Apia), 21h. (Accra and San Fernando), 23h. (Moncalieri).

July 8d. 5h. 53m. 40s. At 43° 8'N. 11° 2'E. (Florence) (as on July 1d. 3h.).

A = +.708, B = +.140, C = +.692; D = +.194, E = -.981;
 G = +.679, H = +.134, K = -.722.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Florence		0.0	—	1 4	+64	—	—	—	1.3
Pola		2.2	61	—	—	—	—	e 0.8	1.8
Rocca di Papa		2.3	152	0 32	-4	1 11	+8	—	1.4
Moncalieri		2.8	295	0 45	+1	1 21	+4	1.7	—
Chur		3.2	338	—	—	1 29	+1	—	—
Pompeii		3.9	142	e 1 9	+8	e 1 41	-6	2.2	2.7
Zurich	E.	4.0	332	e 0 59	-3	i 2 8	+18	—	2.5
	N.	4.0	332	e 0 58	-4	i 2 6	+16	—	2.4
	Z.	4.0	332	e 1 0	-2	i 2 6	+16	—	—
Marseilles		4.3	266	e 1 44	+37	e 2 38	+40	—	—
Besancon		5.0	316	1 54	+37	—	—	—	2.3
Strasbourg		5.3	334	e 1 40	+18	2 42	+17	—	—
Vienna		5.7	37	e 1 4	-24	2 4	-32	2.9	3.3
Barcelona		7.0	254	—	—	—	—	4.0	5.3
Paris		7.8	313	e 3 21	?S	(e 3 21)	-10	4.8	5.3
Uccle		8.4	329	—	—	e 3 20	-27	—	—
De Bilt	E.	9.2	336	—	—	e 4 16	+8	5.0	5.5
Algiers		9.3	224	e 3 0	+40	—	—	—	9.8
Hamburg		9.8	356	—	—	e 4 20	-3	—	6.6
Lemberg		10.7	51	—	—	e 6 20	?SR ₁	—	8.6
Edinburgh		15.3	328	—	—	6 20	-19	—	—

Additional records : Zurich iPE = +1m.18s., iPN = +1m.17s., iPZ = +1m.17s.,
 T₀ = 5h.55m.46s. De Bilt eSN = +4m.32s., MN = +5.6m. Hamburg
 MN = +5.5m., MZ = +6.7m.

1919. July 8d. 21h. 6m. 0s. Epicentre 7° 4'S. 35° 9'E.

(as on 1919 July 4.)

(Adopted, after trial solution, from De Bilt.)

A = +.803, B = +.582, C = -.129; D = +.586, E = -.810;
 G = -.104, H = -.076, K = -.992.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Cape Town		31.0	209	6 54	+16	10 54	-57	14.9	17.4
Helwan	E.	37.5	355	7 42	+8	—	—	—	20.6
	N.	37.5	355	7 0	-34	—	—	—	21.2
Bombay		44.9	52	8 59	+27	—	—	—	26.5
Kodaikanal	E.	45.0	69	8 36	+3	—	—	23.0	28.1
Colombo	E.	46.0	74	8 12	-28	15 42	+14	22.0	31.2
Athens	N.	46.8	348	i 8 40	-6	i 15 24	-14	e 25.1	27.0
	E.	46.8	348	8 42	-4	—	—	—	26.6
Pompeii		52.0	340	i 9 19	-1	i 22 0	?SR ₁	31.0	23.5
Rocca di Papa		53.6	340	9 24	-6	16 54	-10	e 30.4	33.0
Algiers		53.9	329	9 25	-7	16 47	-21	27.9	33.5
Pola		55.9	343	e 9 47	+2	e 17 49	+16	e 30.6	39.2
Barcelona		57.8	331	9 55	-3	17 43	-13	27.4	36.4

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Marseilles	57.8	333	9 56	- 2	—	—	13.3	35.6
Leunberg	58.2	352	e 10 0	0	e 18 24	+23	e 33.2	36.2
Moncalieri	58.2	339	i 10 5	+ 5	18 3	+ 2	23.4	36.8
Tortosa	58.2	330	9 59	- 1	18 8	+ 7	28.9	33.6
Vienna	58.3	348	10 4	+ 3	18 21	+18	e 28.0	39.0
San Fernando	59.0	322	10 12	+ 7	18 12	+ 1	32.5	39.0
Zurich	59.9	340	e 10 12	+ 1	—	—	e 25.1	—
Rio Tinto	60.1	323	24 0	?L	—	—	(24.0)	32.0
Besancon	60.7	339	10 21	+ 4	—	—	35.0	—
Strasbourg	61.2	340	i 10 23	+ 3	i 18 48	+10	e 28.0	40.2
Coimbra	62.8	324	10 25	- 6	i 18 45	-13	29.4	39.6
Paris	63.4	338	i 10 36	+ 2	e 19 14	+ 8	29.0	32.0
Uccle	64.3	340	i 10 42	+ 2	e 19 10	- 7	e 29.0	41.4
Hamburg	64.8	345	i 10 49	+ 5	i 19 44	+21	e 31.0	43.5
De Bilt	65.1	341	i 10 50	+ 4	i 19 44	+18	e 30.0	36.2
Kew	66.5	337	19 0	?S	(19 0)	-44	—	43.0
Oxford	67.2	337	11 2	+ 3	i 19 53	+ 1	27.7	40.5
West Bromwich	68.1	337	11 11	+ 6	19 55	- 8	—	—
Bidston	69.2	337	11 12	0	20 42	+26	—	40.8
Batavia	70.3	93	i 11 56	+37	e 21 29	+59	e 35.1	39.1
Eskdalemuir	70.6	339	10 25	-56	19 28	-65	33.0	43.6
Edinburgh	71.1	339	11 24	0	20 55	+16	34.0	43.0
Dyce E.	71.8	340	i 11 40	+12	i 21 9	+21	—	42.0
Azores	72.9	314	16 0	?PR ₁	—	—	—	—
Rio de Janeiro	77.1	249	21 48	?S	(21 48)	- 2	36.4	—
Manila	87.1	76	e 13 23	+23	—	—	—	—
Taihoku	89.3	65	15 18	+126	—	—	33.9	53.2
Adelaide	96.0	127	24 54	?S	(24 54)	-22	48.6	60.3
Cipoletti	96.1	230	23 42	?S	(23 42)	-95	49.1	61.7
Andalgala N.	97.1	240	22 12	?	—	—	46.8	56.5
Mendoza	97.7	235	23 55	?S	(23 55)	-98	47.6	67.8
La Quiaca	97.8	246	—	—	—	—	76.4	80.6
La Paz	101.2	252	14 4	-12	i 24 37	-90	42.1	52.4
Vieques E.	103.0	288	—	—	—	—	48.2	53.2
Riverview	106.2	129	—	—	e 27 3	+ 9	e 48.7	62.4
Sydney	106.3	129	38 12	?	—	—	54.7	58.8
Ootomari	106.9	42	18 27	?PR ₁	—	—	—	—
Ottawa	110.4	315	i 19 4	[+41]	e 28 30	+58	e 49.0	—
Ithaca N.	111.5	312	—	—	—	—	53.6	—
Cheltenham N.	112.4	310	—	—	—	—	53.0	64.7
E.	112.4	310	—	—	—	—	55.8	61.1
Washington	112.5	310	19 15	[+45]	28 48	+58	50.0	—
Georgetown E.	112.5	310	e 19 52	[+82]	—	—	e 41.0	—
N.	112.5	310	19 52	[+82]	e 28 42	+51	e 41.1	—
Toronto	113.3	314	—	—	—	—	i 55.0	70.1
Ann Arbor N.	116.7	314	18 36?	[-7]	—	—	47.0	68.0
E.	116.7	314	—	—	25 24	—	—	65.0
Chicago	119.6	314	20 0	[+69]	30 0	+74	45.0	66.0
Berkeley	143.8	330	—	—	—	—	e 72.1	—
Lick	143.8	329	—	—	—	—	e 70.0	—
Honolulu	160.6	42	e 25 0	?PR ₁	—	—	32.5	49.0

Additional records : Athens gives SRN = +19m.11s., ME = +24m.18s., T₀ = 21h.6m.9s. Algiers T₀ = 21h.6m.10s. Pola MN = +36.6m. Barcelona PR = +12m.3s., T₀ = 21h.6m.11s. Leunberg ePR? = +13m.24s. Moncalieri MN = +36.8m., T₀ = 21h.6m.11s. Vienna PR₁ = +12m.32s., PR₂ = +13m.49s., SR₁ = +23m.23s. San Fernando MN = 37.0m., T₀ = 21h.6m.18s. Rio Tinto gives +4m.0s. This has been altered to 24m.0s. Strasbourg iPR₁ = 12m.36s., T₀ = 21h.6m.0s. Coimbra iSN = +18m.41s., LN = +28.9m., MN = +38.6m., T₀ = 21h.6m.11s. Paris PR₁ = +12m.55s., iSN = +19m.1s., T₀ = 21h.6m.13s. Uccle iPR₁ = +13m.1s., T₀ = 21h.6m.15s. Hamburg iSN = -19m.30s., MN = -41.8m., MZ = -39.9m., T₀ = 21h.6m.9s. De Bilt iSN = 19m.29s., MN = +43.0m., T₀ = 21h.6m.12s. Epicentre 7° 4S., 35° 9E. Batavia SP = +22m.23s., T₀ = 21h.6m.12s. Eskdalemuir PR₁ = +13m.16s., PR₂ = +34m.41s., T₀ = 21h.5m.22s. Edinburgh PR₁ = +14m.25s., PR₂ = +16m.26s., SR₁ = +25m.27s., SR₂ = +29m.0s. Adelaide S = +35m.36s. La Quiaca gives MN = +80.5m. Riverview ePR₁ = +19m.31s., eSR₁ = +39m.5s., MN = +57.0m. Ann Arbor for W. Instrument LE = +45.0m., ME = +64.0m. Ottawa e = +25m.54s. and +34m.24s., eL = +52.0m.

July 8d. Records also at 0h. (Zurich), 1h. (Osaka and Kobe), 7h. (Helwan), 8h. (Edinburgh), 12h. (Manila (2)), 13h. (Osaka, Kobe, and Manila), 14h. (Manila), 15h. (Melbourne), 16h. (Helwan), 17h. (Vienna), 18h. (Vienna and Mendoza), 19h. (Ootomari), 21h. (Melbourne and Mauritius), 22h. (Berkeley).

July 9d. 16h. 20m. 35s. Epicentre $36^{\circ}0'N$. $141^{\circ}0'E$.

$$A = -.629, B = +.509, C = +.588.$$

Apparently $37^{\circ}0'N$. $143^{\circ}0'E$. as on 1918 May 31 and $37^{\circ}5'N$. $142^{\circ}5'E$. as on 1918 Aug. 25d. 0h. will not suit the records. But possibly this is an anticipation of the shocks on July 26 and August 3, at $35^{\circ}0'N$. $143^{\circ}0'E$.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	1.1	0 16	- 1	0 37	+ 6	—	0.7
Mizusawa	E. 3.1	0 53	+ 4	1 27	+ 1	—	—
	N. 3.1	0 50	+ 1	1 26	0	—	—
Osaka	E. 4.7	1 31	+18	—	—	2.6	3.4

Mizusawa records a second shock at 16h.47m.25s. with PE = +0m.49s., SE = +1m.27s. Osaka MN = +3.0m.

1919. July 9d. 19h. 19m. 25s. Epicentre $17^{\circ}0'N$. $112^{\circ}0'W$.

$$A = -.358, B = -.887, C = +.292; \quad D = -.927, E = +.375;$$

$$G = -.110, H = -.271, K = -.956.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tucson	N. 15.3	5	3 49	+ 6	7 55	+76	10.4	10.8
	E. 15.3	5	—	—	7 49	+70	9.4	—
Lick	22.1	339	—	—	e 9 35	+28	—	—
Berkeley	22.7	339	e 5 19	+ 6	—	—	—	—
Chicago	32.4	36	6 13	-39	i 11 5	-69	13.8	18.1
Victoria	32.8	347	15 53	?L	18 21	?L	19.3	42.0
Ann Arbor	E. 35.0	39	12 47	?S	(12 47)	- 8	(15.9?)	19.4
	N. 35.0	39	—	—	16 29	?L	(16.5)	19.5
Georgetown	37.5	47	e 6 35	-58	e 12 15	-75	e 18.6	—
Cheltenham	N. 37.5	48	12 16	?S	(12 16)	-75	18.9	19.6
Washington	37.5	47	6 51	-43	12 20	+71	18.8	—
Ithaca	N. 39.5	42	e 8 0	+ 9	—	—	e 18.3	—
Ottawa	41.4	40	i 8 51	+45	i 13 19	-68	e 20.4	—
Northfield	42.8	41	—	—	—	—	e 23.6	—
La Paz	54.7	125	9 36	- 1	17 14	- 3	26.2	28.1
Edinburgh	86.1	32	22 59	?S	(22 59)	-32	44.6	49.6
Eskdalemuir	86.3	32	—	—	23 35	+ 2	—	—
San Fernando	N. 92.1	50	44 35	?L	—	—	(44.6)	—
De Bilt	92.2	32	—	—	e 24 4	-33	42.6	48.9
Hamburg	93.8	30	—	—	e 26 35	+101	e 43.6	61.6
Moncalieri	97.4	39	—	—	—	—	e 46.0	—
Rocca di Papa	102.2	39	—	—	—	—	—	41.9
Helwan	121.3	37	79 35	?L	—	—	(79.6)	—

Additional records: Ann Arbor gives L as S. W. Instrument LE = +17.8m., ME = +19.1m. Georgetown LN = +22.6m., LE = +23.6m. Ottawa iN = +16m.9s., L = +22.6m. and +40.6m. La Paz T₀ = 19h.19m.28s. De Bilt MN = +44.2m. Hamburg MN = +56.6m. Helwan PN = +77m.35s.(?LN). Moncalieri L = +51.9m.

July 9d. Records also at 1h. (San Fernando), 5h. (La Paz), 7h. (Edinburgh, Hamburg, De Bilt, and Batavia), 8h. (Helwan), 10h. (La Paz), 18h. (Helwan), 20h. (Mendoza), 21h. (Lick, Simla, and Florence (2)).

July 10d. 2h. 22m. 10s. Epicentre $50^{\circ}0'N$. $128^{\circ}0'W$. (as on 1919 July 1d.).

$$A = -.396, B = -.507, C = +.767.$$

	Δ °	Az. °	P. m. s.	O-C. s.	L. m.	M. m.
Victoria	3.4	114	0 53	0	1.4	1.9
Chicago	28.9	91	—	—	e 15.3	—
Toronto	33.4	81	—	—	18.3	—
Ottawa	34.8	77	—	—	16.6	—
Georgetown	37.2	88	e 19 20	?L	(e 19.3)	—
Washington	37.2	88	—	—	e 20.5	—
De Bilt	E. 70.5	29	—	—	e 34.8	—

Ottawa L = +18.3m. and +21.8m. Georgetown gives also eN = +19m.6s., LN = +22.0m. De Bilt LN = e33.8m.

July 10d. Records also at 3h. (La Paz), 4h. (close to Florence), 8h. (Colombo), 13h. (close to Athens), 16h. (close to Taihoku), 19h. (near Balboa Heights), 20h. (San Fernando and close to Kobe and Osaka), 21h. (close to Taihoku), 22h. (Taihoku).

1919. July 11d. 0h. 30m. 30s. Epicentre $8^{\circ}0'N$. $72^{\circ}0'W$.

A = +.306, B = -.942, C = +.139; D = -.951, E = -.309;
G = +.043, H = -.132, K = -.990.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Vieques	E.	12.0	31	6 1	+182	7 8	+109	8.3
La Paz		24.8	171	15 29	-7	19 46	-13	11.6
Georgetown		31.2	352	6 30	-10	11 42	-12	14.0
Washington		31.2	352	6 27	-13	13 30	+96	20.3
Ithaca	E.	34.7	355	—	—	12 18	-33	14.9
Andalgala	N.	36.0	171	—	—	—	—	18.6
Toronto		36.2	351	—	—	—	—	15.8
Chicago		36.5	340	17 20	-6	113 0	-17	17.6
Ottawa		37.5	357	17 41	+7	113 50	+19	27.5
Pilar		40.4	169	—	—	—	—	22.2
Rio de Janeiro		41.8	140	e 21 0	?	22 48	?	24.4
Cipolletti		47.1	175	20 6	?L	—	—	27.9
Victoria		59.0	323	—	—	—	—	36.4
Coimbra		64.8	50	—	—	—	e 24.5	—
Rio Tinto		65.7	52	44 30	?L	—	(44.5)	49.5
Bidston		71.1	38	9 0	-144	16 48	?PR ₁	34.9
Eskdalemuir		71.4	35	—	—	20 50	+7	34.5
De Bilt		75.8	39	—	—	e 21 37	+2	e 35.5
Moncalieri		77.1	46	—	—	(21 46)	-4	21.8
Hamburg		78.9	37	e 12 14	+2	e 22 18	+7	e 35.5
Rocca di Papa		80.8	50	—	—	(e 22 36)	+3	e 22.6
Helwan		97.4	59	26 30	?S	(26 30)	+60	—

Additional records: Vieques PN = +5m.27s. Georgetown SN = +11m.43s.,
To = 0h.30m.26s. Ithaca cN = +9m.0s. and +12m.2s. Toronto L =
+18.5m. Chicago SR₁ = +15m.45s. Ottawa LN = +9m.3s. eN? =
+20m.0s., T₀ = 0h.30m.25s. Pilar MN = +26.7m. De Bilt eLN =
+32.5m., MN = +36.5m. Hamburg MN = +38.5m., T₀ = 0h.30m.36s.
Helwan PN = +24m.30s. (?S).

July 11d. 4h. 9m. 25s. Epicentre $8^{\circ}0'N$. $72^{\circ}0'W$. (as at 0h.).

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
La Paz		24.8	15 27	-9	19 45	-14	11.7
Chicago		36.5	7 18	-8	13 5	-12	21.1
De Bilt	E.	75.8	—	—	—	e 38.6	39.9

Chicago gives SR₁ = +15m.50s. De Bilt eLN = +33.6m.

July 11d. 18h. 3m. 50s. Repetition from $8^{\circ}0'N$. $72^{\circ}0'W$.? La Paz gives eP = +5m.27s., S = +9m.43s., M = +18.8m. Possibly some or all of the following records only at La Paz, which would ordinarily have been mentioned below in the notes, represent other repetitions, and may be here tabulated:—

La Paz P = 3h.27m.14s. eP = 3h.31m.41s.
P = 4h. 7m.13s. eP = 5h.33m.40s.

July 11d. Records also at 1h. (La Quiaca), 2h. (Colombo), 4h. (Balboa Heights), 5h. (Helwan and close to Athens), 17h. (Manila), 19h. (Moncalieri), 21h. (San Fernando).

July 12d. 12h. 4m. 30s. Epicentre $42.5^{\circ}N$. $7.5^{\circ}E$. (as on 1918 Aug. 10d. 18h.).

A = +.731, B = +.096, C = +.676.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa		3.9	e 1 25	+24	—	—	3.1
Zurich		4.9	i 1 17	+1	i 1 56	-18	2.0
Vienna		8.5	e 2 0	-9	—	—	2.8

Zurich. The records on E, N, V instruments are sensibly the same: also eP = +1m.13s.

July 12d. 22h. 28m. 0s. Epicentre $55^{\circ}0'N$. $35^{\circ}0'W$. (as on 1919 May 5d.).

A = +.470, B = -.329, C = +.819; D = -.574, E = -.819;
G = +.671, H = -.470, K = -.574.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Edinburgh	17.9	75	4 18	+ 2	6 22	-76	8.0	10.3
Eskdalemuir	18.0	76	i 4 21	+ 4	—	—	9.0	—
Oxford	20.2	85	4 53	+10	8 45	+18	10.3	14.2
Kew	20.9	84	—	—	—	—	—	11.0
Coimbra	23.0	119	5 40	+23	10 0	+35	11.9	—
Paris	23.6	90	e 5 31	+ 7	—	—	12.0	13.7
De Bilt	23.7	80	5 29	+ 4	9 43	+ 5	11.4	14.0
Uccle	23.8	83	e 5 27	+ 1	e 9 42	+ 2	e 11.5	13.0
Hamburg	26.0	74	e 5 45	- 3	i 10 22	0	e 14.0	15.0
Strasbourg	26.8	86	5 51	- 5	10 43	+ 6	e 15.7	—
San Fernando	27.0	122	14 0	?L	—	—	(14.0)	17.5
Tortosa	27.3	106	6 17	+16	10 43	- 3	13.5	19.2
Ottawa	27.3	266	—	—	e 10 30	-16	e 15.5	—
Moncalieri	28.7	94	6 26	+11	—	—	14.8	—
Toronto	30.5	266	—	—	—	—	14.1	—
Rocca di Papa	33.5	92	e 7 5	+ 4	—	—	—	—
Chicago	35.9	270	7 45	+24	13 38	+29	19.5	—
Helwan	52.6	88	—	—	17 0	+ 9	—	—

Additional records: Coimbra $T_0 = 22h.28m.13s.$ De Bilt MN = +17.4m.,
 $T_0 = 22h.28m.11s.$, Epicentre $57^{\circ}3'N.$, $35^{\circ}1'W$. Hamburg $T_0 = 22h.27m.56s.$
San Fernando MN = +17.0m.

July 12d. Records also at 0h. (Rio Tinto and close to Mizusawa), 2h. (close to Rocca di Papa), 3h. (La Paz), 4h. (near Tokyo and Osaka), 8h. (Taihoku), 9h. (Manila), 10h. (Tokyo), 16h. (Rocca di Papa), 17h. (Bidston), 19h. (Colombo).

July 13d. Records at 2h. (San Fernando), 5h. (close to Manila and La Paz), 13h. (Helwan), 14h. (Manila and close to Mizusawa).

July 14d. 13h. 44m. 50s. At $52^{\circ}0'N$. $178^{\circ}0'W$. (as on 1919 May 22d.).

A = -.615, B = -.021, C = +.788; D = -.035, E = +.999;
G = -.788, H = -.028, K = -.616.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Honolulu	34.4	146	e 5 28	-100	—	—	14.7	20.2
Osaka	37.2	262	7 51	+19	—	—	14.7	17.8
Zi-ka-wei	48.2	271	e 8 38	-17	e 15 30	-26	—	—
Chicago	58.5	61	—	—	—	—	40.2	—
Manila	60.8	259	e 10 10	- 8	—	—	—	—
Toronto	61.5	55	29 4	?L	—	—	e 38.2	53.7
Ottawa	62.0	51	—	—	—	—	e 31.2	—
Georgetown	66.1	58	e 31 27	?L	—	—	e 41.8	—
Washington	66.1	58	—	—	—	—	e 41.8	—
Hamburg	74.1	355	e 11 54	+11	—	—	e 40.2	50.2
Bidston	74.5	2	24 22	?	28 58	?	—	48.2
De Bilt	75.8	357	e 12 12	+18	e 21 55	+20	—	51.9
Kew	76.5	2	—	—	—	—	—	57.2
Uccle	77.1	358	e 12 10	+ 8	e 22 10	+20	e 37.2	54.2
Vienna	79.0	350	12 12	- 1	—	—	e 42.7	53.7
Strasbourg	79.3	355	12 19	+ 4	e 22 24	+ 9	e 40.2	—
Pola	82.6	351	—	—	—	—	—	51.2
Moncalieri	82.9	357	e 10 14	-141	23 11?	+15	46.6	53.8
Rocca di Papa	85.8	352	12 52	0	—	—	53.2	59.2
Rio Tinto	89.9	7	51 10	?L	—	—	(51.2)	60.2
Helwan	94.2	335	25 10	?S	(25 10)	+12	—	—

Additional records: Zi-ka-wei $T_0 = 13h.44m.48s.$ Ottawa L = +40.2m.
Washington eE = +31m.27s., eN? = +41m.38s. Eskdalemuir $\Delta = 72^{\circ}5,$
gives simply 13h.52m. - 15h.30m. De Bilt eSN = +21m.49s., eSR₁N =
+27m.11s., MN = +54.7m., $T_0 = 13h.45m.17s.$ Uccle SR₁ = +27m.32s.,
 $T_0 = 13h.45m.0s.$ Vienna MN = 57.2m. The P record is from Z
machine. Helwan PN = +17m.10s.

July 14d. 14h. 22m. 0s. At 40°·0N. 60°·0E. ?

$$A = +\cdot383, B = +\cdot664, C = +\cdot643.$$

If the records all refer to a single shock, the solution below is about the best we can get from the material. But it seems more probable that there were two shocks, one in India and one in Western Europe.

	Δ °	P. m. s.	O—C. s.	S. m. s.	O—C. s.	L. m.	M. m.
Simla	16·5	e 3 48	-11	—	—	—	8·0
Lemberg	27·0	e 6 54	+56	—	—	—	13·6
Kodaikanal	33·5	14 12	?S	(14 12)	+100	17·3	18·3
Colombo	37·6	16 0	?S	(16 0)	+148	—	27·4
Coimbra	51·0	8 45	-28	—	—	19·8	—
San Fernando	51·0	17 30	?S	(17 30)	+59	—	29·5

July 14d. Records also at 3h. (close to Athens (2)), 8h. (Apia), 10h. (Helwan and Taihoku), 11h. (Manila (2) and La Paz), 12h. (Helwan), 18h. (close to Tokyo at 18h.19m., Zi-ka-wei at 18h.51m.).

July 15d. 5h. 25m. 30s. Epicentre 45°·1N. 147°·2E. (as on 1918 May 31d.).

$$A = -\cdot593, B = +\cdot382, C = +\cdot708; \quad D = +\cdot542, E = +\cdot841; \\ G = -\cdot595, H = +\cdot384, K = -\cdot706.$$

	Δ °	Az. °	P. m. s.	O—C. s.	S. m. s.	O—C. s.	L. m.	M. m.
Mizusawa E.	7·5	219	1 56	+ 2	3 28	+ 4	—	—
N.	7·5	219	2 6	+12	3 29	+ 5	—	—
Manila	37·7	224	7 30	- 6	—	—	—	—
Hamburg	74·8	335	—	—	—	—	e 44·5	48·5
De Bilt	77·5	337	—	—	—	—	e 36·5	50·7
Uccle	78·8	337	e 11 30	-42	—	—	36·5	44·5
Bidston	78·2	341	47 0	?L	—	—	(47·0)	49·7

De Bilt gives eLN = +43·5m., MN = +48·6m.

July 15d. Records also at 2h. (San Fernando and Taihoku), 12h. (La Paz), 13h. (Berkeley), 16h. (Batavia), 17h. (Athens), 23h. (Lick).

July 16d. 4h. 9m. 15s. Epicentre 45°·1N. 147°·2E. (as on 1919 July 15d.).

$$A = -\cdot593, B = +\cdot382, C = +\cdot708.$$

	Δ °	Az. °	P. m. s.	O—C. s.	S. m. s.	O—C. s.	L. m.	M. m.
Ootomari	3·5	298	1 16	+21	—	—	2·0	—
Mizusawa	7·5	219	1 47	- 7	2 57	-27	—	—
Tokyo	11·0	213	2 44	0	4 17	-37	—	—
Osaka	13·8	225	3 30	+ 7	—	—	6·1	6·4
Zi-ka-wei	24·4	244	e 5 25	- 7	e 9 41	-11	—	—
Manila	37·7	224	12 57	?S	(12 57)	-37	—	—
Hamburg	74·8	335	11 53	+ 5	—	—	e 44·7	46·7
De Bilt	77·5	337	—	—	e 22 3	+ 8	e 41·8	42·9
Bidston	78·2	341	32 21	?	39 3	?L	(39·0)	49·8
Uccle	78·8	337	e 12 17	+ 5	e 22 15	+ 5	e 4·8	48·8
Strasbourg	79·9	334	e 12 20	—	—	—	—	—
Helwan	85·1	308	23 45	?S	(23 45)	+25	—	—

Eskdalemuir ($\Delta = 76^\circ\cdot5$) gives simply 4h.31m. to 5h.22m. Helwan PN = +22m.45s. De Bilt eLN = +42·8m., MN = +47·1m.

July 16d. 18h. 6m. 30s. Epicentre $16^{\circ}08'$, $171^{\circ}0'W$. (as on 1917 June 28d.).

A = -·949, B = -·150, C = -·276; D = -·156, E = +·988;

G = +·272, H = +·043, K = -·961.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	2·3	340	i 0 37	+ 1	—	—	—	1·1
Riverview	38·3	—	—	—	e 13 32	-10	e 18·4	21·7
Honolulu	39·5	19	e 14 24	?S	(14 24)	+25	22·9	26·0
Melbourne	44·4	232	—	—	—	—	24·4	27·6
Manila	73·6	291	e 12 18	+38	—	—	—	—
Chicago	95·8	48	e 44 30	?L	—	—	51·5	—
De Bilt	143·8	4	—	—	—	—	e 83·5	89·3
Uccle	145·0	5	—	—	—	—	e 82·5	—
Helwan	155·3	308	105 30	?L	—	—	(105·5)	—

Riverview eS = +8m55s., MN = +30·5m.
+107m.30s. De Bilt MN = +89·4m.

Helwan gives also PN =

July 16d. Records also at 0h. (San Fernando and close to Manila), 1h. (Florence), 3h. (Riverview), 8h. (Mizusawa), 10h. (Manila), 11h. (Colombo), 14h. (Tokyo), 17h. (Helwan).

July 17d. 9h. 49m. 5s. Epicentre $24^{\circ}0'N$, $121^{\circ}0'E$. (as on 1918 Sept. 24d.).

A = -·470, B = +·783, C = +·407; D = +·857, E = +·515;

G = -·210, H = +·349, K = -·914.

It seems clear that there must be at least one erroneous record, or a double shock. Difficulties were also found on 1918 April 18d.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1·1	24	0 43	+26	—	—	2·0	2·4
Zi-ka-wei	7·2	3	e 1 24	-25	e 2 38	-37	—	6·5
Manila	9·4	180	2 35	+13	—	—	5·1	7·3
Nagasaki	11·8	39	1 41	-75	—	—	—	—
Osaka	16·5	46	5 19	+80	9 22	+135	12·5	17·0
Tokyo	20·0	50	0 40	?	10 53	+150	—	—
Batavia	33·2	206	7 2	+ 4	—	—	—	—
Simla	39·2	290	—	—	—	—	e 22·2	—
Riverview	64·6	152	—	—	—	—	e 34·6	36·8
Lemberg	76·1	319	41 7	?L	—	—	(41·1)	52·8
Helwan	77·9	297	46 55	?L	—	—	(46·9)	—
Vienna	81·4	320	e 44 55	?L	—	—	(44·9)	53·9
Hamburg	82·3	327	e 41 55	?L	—	—	e 44·9	e 45·9
De Bilt	85·6	326	—	—	—	—	44·9	50·0
Strasbourg	86·2	321	43 55	?L	—	—	(43·9)	—
Rocca di Papa	86·8	315	—	—	(21 55)	-104	22·9	50·9
Uccle	86·7	326	—	—	—	—	e 42·9	56·9
Moncalieri	88·1	319	e 38 5	?	—	—	47·8	—
Kew	88·6	328	—	—	—	—	—	51·9
Bidston	88·7	330	31 19	?SR ₁	43 43	?L	(43·7)	59·5
Paris	88·9	325	—	—	—	—	46·9	56·9
Coimbra	100·4	324	e 44 25	?L	—	—	53·0	—
San Fernando	101·6	319	52 55	?L	—	—	(52·9)	58·9
Ottawa	109·0	12	—	—	—	—	62·9	—
Chicago	109·1	22	—	—	—	—	e 58·9	—

Additional records: Zi-ka-wei MN = +6·3m., T₀ - 9h.48m.58s. Manila
MN = +7·4m. Osaka T₀ 9h.49m.20s. Uccle MN = +48·4m.
Eskdalemuir (Δ = 87·5) gives 10h.30m. to 11h.7m. De Bilt eLN = +43·9m.,
MN = +48·6m.

1919. July 17d. 16h. 19m. 34s. Epicentre 11° 0N. 88° 0W.

(as on 1918 July 31d. 14h.).

$$A = +.034, B = -.982, C = +.191; D = -.999, E = -.035; \\ G = +.007, H = -.191, K = -.982.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Hts.	E.	8.6	104	2 30	-20	4 18	+25	6.0	6.3
	N.	8.6	104	2 40	-30	—	—	6.0	6.2
Vieques	E.	23.0	67	8 16	?S	(8 16)	-69	16.2	17.3
Cheltenham	E.	29.4	18	11 8	?S	(11 8)	-16	17.1	—
	N.	29.4	18	11 37	?S	(11 37)	+13	16.3	19.4
Washington		29.6	17	6 23	-1	11 26	-1	16.3	—
Georgetown		29.6	17	16 24	0	e 11 30	+3	e 16.4	—
Chicago		30.8	0	6 31	-5	11 36	-12	18.4	—
Ann Arbor	E.	31.5	6	6 20	-23	—	—	17.4	—
	N.	31.5	6	6 32	-11	11 50	-10	17.9	21.6
Ithaca	E.	33.0	17	—	—	12 22	-2	e 17.5	—
	N.	33.0	17	6 46	-10	e 12 12	-12	e 19.2	—
Toronto		33.5	11	16 56	-5	e 14 20	+108	19.8	29.1
La Paz		33.8	144	7 27	+24	13 9	+31	17.5	22.9
Ottawa		35.9	16	17 18	-3	13 6	-3	e 18.4	—
Victoria		47.6	330	—	—	30 14	?	33.7	37.4
Coimbra		75.1	51	—	—	e 21 16	-11	37.0	39.9
Eskdalemuir		78.0	35	—	—	—	—	36.4	—
Kew		80.0	39	—	—	—	—	—	49.4
Paris		82.2	42	—	—	—	—	e 38.4	46.4
Uccle		83.0	40	—	—	e 22 26	-31	—	42.4
De Bilt	E.	83.3	39	—	—	—	—	e 39.4	48.3
	N.	83.3	39	—	—	—	—	e 37.4	45.5
Strasbourg		85.6	41	—	—	e 22 56	-30	—	50.8
Hamburg		85.9	37	—	—	—	—	e 41.4	54.4
Moncalieri		86.3	46	—	—	e 24 44	+71	42.5	—
Zurich		86.4	43	36 0	?	—	—	—	—
Helwan		108.9	52	57 26	?L	—	—	(57.4)	—

Additional records: Georgetown gives $LEN = +21.4m.$, $T_0 = 16h.19m.31s.$
 Ann Arbor (W Instrument) $LE = +17.5m.$, $PN = +7m.32s.$ Toronto
 $iP = +10m.50s.$, $L = +21.0m.$ Ottawa $PR_1N = +8m.30s.$, $PR_2N =$
 $+8m.50s.$, $L = +20.4m.$, $T_0 = 16h.19m.46s.$ Zurich gives six records
 practically identical.

July 17d. Records also at 4h. (Helwan), 7h. (close to Manila), 8h. (Riverview),
 11h. (close to La Paz, also Taihoku and Zi-ka-wei, possibly repetition
 from 9h.), 12h. (Taihoku (2) and Zi-ka-wei: other repetitions from 9h.?),
 13h. (Mizusawa), 14h. (Taihoku and Zi-ka-wei), 15h. (Manila), 16h.
 (Mizusawa), 17h. (Mauritius), 19h. (Zi-ka-wei), 20h. (close to Batavia
 and Helwan), 21h. (close to Batavia), 22h. (La Paz).

July 18d. 2h. 28m. 0s. Epicentre 39° 5N. 27° 0W. (as on 1917 June 30d.).

$$A = +.687, B = -.350, C = +.636.$$

(Very uncertain).

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Uccle	24.6	e 5 52	+18	e 9 50	-5	e 11.5	—
De Bilt	25.4	—	—	e 10 2	-9	e 12.1	13.1
Strasbourg	26.3	7 0	+69	—	—	14.0	—
Chicago	45.0	—	—	—	—	e 25.0	—

Uccle gives T_0 at 2h.28m.(54s.).

July 18d. 7h. 1m. 20s. Epicentre 36° 0N. 28° 0E. (as on 1918 Sept. 23d.).

$$A = +.714, B = +.380, C = +.588; D = +.470, E = -.883; \\ G = +.519, H = +.276, K = -.809.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3.9	302	e 0 56	-5	2 0	-13	e 2.2	2.5
Rocca di Papa	13.2	301	e 2 59	-17	—	—	e 7.7	9.5
Vienna	15.0	329	3 40	-1	11 0	?	24.7	—
Strasbourg	19.4	317	4 21?	-13	5 0	?	—	—
Hamburg	21.6	330	e 4 46	-14	e 9 4	+7	—	16.3
Paris	22.6	313	e 9 17	?S	(9 17)	0	13.7	—
De Bilt	22.8	322	—	—	e 9 18	-3	e 12.7	15.6

Additional records: Athens $MN = +2.9m.$, $T_0 = 7h.0m.57s.$ Rocca di Papa
 $e = -1m.29s.$ Hamburg $MN = -15.3m.$ De Bilt $MN = +13.6m.$

July 18d. 13h. 37m. 0s. Epicentre $43^{\circ}0'N$. $125^{\circ}0'W$. (as on 1918 June 12d.).

$$A = -.420, B = -.599, C = +.682.$$

(Very uncertain).

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Victoria	5.5	12	1 20	- 5	—	—	2.8	3.3
Chicago	27.4	80	5 44	-18	11 10	+22	16.2	—
Washington	36.0	80	e 6 50	-32	—	—	21.0	—
Cheltenham	36.2	80	—	—	—	—	21.6	23.3
De Bilt	75.6	29	—	—	e 29 0	? e	34.0	37.8
Uccle	76.4	30	—	—	—	—	33.0	37.0

Additional records: Victoria PV = +1m.16s., MV = +3.6m. Cheltenham
LN = +20.8m. De Bilt eN = +31m.0s., MN = +38.8m.

July 18d. 15h. 7m. 0s. Epicentre $24^{\circ}0'N$. $121^{\circ}0'E$. (as on 1919 July 17d. 9h.).

$$A = -.470, B = +.783, C = +.407.$$

The solution is not satisfactory, but no solution suggests itself which will suit all three near stations. Difficulties appeared also on 1919 July 17d. and 1918 April 18d.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Taihoku	1.1	24	1 41	+84	—	—	1.9	2.3
Hokoto	1.3	251	0 17	- 3	—	—	0.6	0.7
Zi-ka-wei	7.2	3	—	—	—	—	e 4.3	—
Manila	9.4	180	—	—	e 5 16	+63	—	—
De Bilt	85.6	326	—	—	—	—	e 49.0	50.0
Uccle	86.7	326	—	—	—	—	e 48.0	—

De Bilt gives MN = +50.2m.

July 18d. Records also at 0h. (San Fernando and Helwan), 5h. (Pompeii and near Osaka), 6h. ($3^{\circ}3'$ from Tokyo and $5^{\circ}6'$ from Mizusawa at 6h.52m.30s., almost simultaneously with another shock recorded by Moncalieri ($\Delta = 31^{\circ}$) and Florence), 7h. (La Paz), 8h. (Taihoku), 10h. (Batavia and Manila), 13h. (Toronto), 17h. (Eskdalemuir), 22h. (Helwan).

July 19d. Records at 2h. (San Fernando), 5h. (Taihoku (2)), 6h. (Taihoku and Apia), 10h. (Tokyo), 14h. (Paris).

July 20d. 0h. 3m. 50s. Epicentre $36^{\circ}0'N$. $28^{\circ}0'E$. (as on July 18d. 7h.).

$$A = +.714, B = +.380, C = +.588.$$

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Athens	3.9	302	1 7	+ 6	1 49	+ 2	1.9	2.2
Rocca di Papa	13.2	301	3 4	-12	—	—	—	6.0
Strasbourg	19.4	317	—	—	6 10	?	16.2	—
Uccle	22.6	318	—	—	e 9 10	- 7 e	12.2	—
De Bilt	22.8	322	—	—	e 9 14	- 7	—	15.4

Athens gives also MN = +2.4m., $T_0 = 0h.4m.4s$. Rocca di Papa P = +4m.4s.

July 20d. Records also at 6h.25m.20s. (between Mizusawa, Tokyo, and Osaka), 8h. (Chicago, Batavia, and Manila), 15h. 39m.0s. (close to Batavia), 16h. (San Fernando and Tokyo).

July 21d. 19h. 3m. 53s. Epicentre 3°0S . 100°9E . (adopted from Batavia).

$$A = -.189, B = +.981, C = -.052; \quad D = +.982, E = +.189; \\ G = +.010, H = -.051, K = -.999.$$

There was apparently more than one shock about this time. The Osaka records indicate one close to Osaka, and the Athens records one close to Athens; but it does not seem likely that the latter is responsible for the other European records.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Batavia	6.7	119	i 1 44	+ 2	3 6	+ 4	—	4.8
Colombo	23.3	295	10 7	? 8	(10 7)	+ 36	—	12.1
Manila	26.5	48	e 5 35	-18	—	—	—	—
Bombay	35.2	310	6 37	-38	—	—	—	—
Osaka	49.7	39	8 39	-26	—	—	9.8	9.8
Helwan	74.0	303	23 7	?	(20 7)	-67	—	—
Rocca di Papa	90.7	313	i 13 11	- 9	—	—	—	15.1
Hamburg	93.0	324	e 14 7	+35	i 23 31	-74	e 38.1	—
De Bilt	95.9	322	—	—	e 23 48	-87	—	—
La Paz	157.6	209	20 37	[+31]	—	—	—	—

Batavia gives $T_0 = 19\text{h.}3\text{m.}53\text{s.}$ Epicentre 3°0S . 100°9E ., as adopted above.

July 21d. 23h. 49m. 20s. Epicentre 42°0N . 141°0E .

$$A = -.577, B = +.467, C = +.669.$$

This fits the observations, though a more usual position would be 38°5N . 144°5E . (as on 1917 Mar. 15).

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mizusawa	2.9	0 44	- 1	1 14	- 6	—	—
Tokyo	6.4	e 1 51	+13	—	—	—	—
Osaka	8.5	2 13	+ 4	—	—	4.3	4.5

Mizusawa SN = +1m.12s.

July 21d. Records also at 5h. (Batavia), 8h. and 12h. (Colombo), 13h. (Manila).

July 22d. 22h. 1m. 25s. Epicentre 13°0N . 83°0W . (as on 1917 Oct. 22d.).

$$A = +.119, B = -.967, C = +.225; \quad D = -.993, E = -.122; \\ G = +.027, H = -.223, K = -.974.$$

The residuals suggest an epicentre about 2° nearer La Paz, say at 12°0N . 82°0W .

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Balboa Heights	E. 5.3	139	0 59	-23	—	—	1.0	1.2
	N. 5.3	139	1 1	-21	—	—	2.5	2.6
Vieques	E. 17.7	71	4 43	+30	—	—	9.4	11.3
Cheltenham	E. 26.3	11	6 0	+ 9	10 32	+ 4	12.7	13.2
Washington		10	i 5 45	- 7	i 10 22	- 8	12.9	—
Georgetown	E. 26.4	10	i 5 48	- 4	i 10 23	- 7	e 12.4	—
Chicago		353	i 5 49	-30	i 10 27	-52	13.1	—
Ann Arbor		359	i 5 53	-28	10 47	-35	13.1	13.5
Ithaca	E. 29.9	10	6 31	+ 4	11 28	- 4	13.7	—
Toronto		5	6 41	+ 5	12 35	+47	e 18.4	20.8
Northfield		14	6 36	-16	11 56	-18	e 15.6	—
Ottawa		9	i 6 40	-16	i 11 57	-27	e 16.1	—
La Paz		153	6 39	-17	11 56	-28	15.9	16.9
Victoria		325	—	—	—	—	33.6	37.6
Coimbra		51	—	—	e 21 5	+40	34.6	—
Eskdalemuir		36	—	—	21 35	+27	—	—
Bidston		39	10 35	-65	14 59	?PR ₁	—	26.3
Kew		40	—	—	—	—	—	43.6
Tortosa		50	11 39	-20	21 51	+ 6	33.0	41.2
Uccle		41	e 12 6	- 3	e 22 0	- 4	e 38.6	40.6
De Bilt		39	12 8	- 3	22 4	- 3	e 38.6	41.2
Strasbourg		42	12 21	- 3	22 27	- 6	e 29.6	—
Hamburg		37	i 12 56	+29	e 22 30	- 8	e 33.6	—
Rocca di Papa		48	e 12 47	- 4	—	—	16.6	24.2
Vienna	Z. 86.4	40	e 12 29	-26	—	—	23.6	—
Helwan	E. 103.7	54	19 35	?PR ₁	—	—	—	—
	N. 103.7	54	26 35	?S	(26 35)	+ 5	—	—

For Notes see next page.

NOTES TO JULY 22d. 22h. 1m. 25s.

Additional records: Vieques gives PN = +4m.41s. Cheltenham PN = +5m.56s., LN = +12.6m., MN = +22.3m. Georgetown iPN = +5m.47s., iPZ = +5m.46s., SZ = +10m.28s., eLZ = +12.1m., T₀ = 22h.1m.25s. Chicago PR₁ = +7m.19s. Ann Arbor. The records above are for the Bosch inst. The Wiechert gives P = +6m.5s., with others the same as above. Ithaca N sensibly same as E, T₀ = 22h.1m.42s. Toronto i = +10m.5s., T₀ = 22h.0s.42s. Ottawa i = +7m.12s., e = +7m.45s., e = +12m.55s., i = +14m.41s., T₀ = 22h.1m.25s. La Paz T₀ = 22h.1m.24s. Uccle PR₁ = +15m.10s., T₀ = 22h.1m.35s. De Bilt ePR₁E = +15m.16s., e(SR₁) = +28m.10s., m = +28m.24s., m = +28m.32s., eLN = +34.6m., MN = +45.9m., T₀ = 22h.1m.35s. Strasbourg T₀ = 22h.1m.38s. Hamburg T₀ = 22h.2m.45s. Vienna i = +13m.22s.

July 22d. Records also at 0h. (Lick), 2h. (Barcelona), 8h. (Manila), 15h. (Batavia), 17h. (Manila and Florence), 19h. (Mizusawa, Florence, and Helwan).

July 23d. Records at 0h. (San Fernando), 0h. (Batavia), 9h.53m.0s. (close to Athens), 18h. (Manila), 19h.30m.35s. (Mizusawa, perhaps repetition from 38°·5N. 144°·5E., as on July 21d. 23h.), 20h. (La Paz).

1919. July 24d. 2h. 3m. 20s. Epicentre 40°·0N. 76°·0E.

A = +·185, B = +·743, C = +·643; D = +·970, E = -·242;
G = +·155, H = +·624, K = -·766.

Since an epicentre near this (37°·5N. 70°·0E.) on 1917 April 21 was found to have a deep focus, the present observations were discussed for this possibility, but without a positive result.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Simla	9·0	174	e 1 58	-18	—	—	e 4·3	4·6
Dehra Dun	9·8	171	3 40	+73	—	—	—	—
Calcutta	E. 20·4	146	4 40	-6	8 22	-10	11·1	—
Bombay	21·3	188	4 48	-9	—	—	—	11·1
Kodaikanal	E. 29·9	177	10 58	?S	(10 58)	-34	15·1	16·1
Colombo	33·3	173	—	—	12 40	+11	15·7	18·2
Lemberg	37·2	301	e 8 52	+80	13 22	-5	19·4	22·8
Zi-ka-wei	37·5	89	7 29	-5	e 13 17	-14	—	26·8
Helwan	E. 37·6	268	12 46	?S	(12 46)	-46	—	27·1
	N. 37·6	268	11 46	?S	(11 46)	-106	—	22·7
Athens	E. 40·1	282	7 47	-9	i 13 55	-13	e 21·2	31·7
Taihoku	40·7	98	7 28	-33	—	—	23·2	24·6
Budapest	40·8	300	7 40	-21	—	—	—	—
Vienna	42·5	301	i 8 10	-5	14 16	-26	17·9	24·7
Pola	45·0	298	e 14 40	?S	(e 14 40)	-35	e 18·7	29·5
Hamburg	45·4	310	e 8 32	-4	e 15 17	+3	—	31·9
Pompeii	45·9	291	i 8 34	-5	15 30	+3	30·7	—
Kobe	46·4	78	8 48	+5	—	—	30·9	—
Manila	46·6	110	e 8 48	+4	16 58	+82	27·8	32·0
Osaka	46·7	78	8 40	-5	—	—	25·4	31·4
Rocca di Papa	46·8	293	i 8 41	-5	e 15 33	-5	e 29·2	35·2
Florence	47·1	297	9 34	+46	17 40	+118	—	24·7
Ootomari	47·5	59	9 1	+10	—	—	—	—
Zurich	47·8	300	e 8 43	-10	—	—	—	—
Strasbourg	48·0	302	i 8 52	-2	i 15 52	-2	e 23·7	—
De Bilt	48·6	310	9 0	+2	16 3	+2	e 24·7	33·8
Moncalieri	49·1	300	9 3	-2	16 3	-4	25·4	31·0
Uccle	49·4	309	e 9 0	-3	i 16 12	+1	24·7	33·6
Besancon	49·5	302	9 4	0	16 12?	-1	—	29·7
Tokyo	49·8	74	9 9	+3	28 43	?L	(28·7)	—
Paris	51·2	308	e 9 18	+4	e 16 35	+1	20·7	31·7
Marseilles	51·3	298	e 16 29	?S	(e 16 29)	-6	30·2	—
Kew	52·0	310	19 40	?S	—	—	—	29·7
Eskdalemuir	52·4	315	9 30	+8	17 1	+12	27·7	35·0
Oxford	52·5	310	9 26	+3	16 54	+4	27·6	37·6
Barcelona	54·2	297	9 36	+2	17 15	+4	30·2	35·7
Batavia	54·2	140	e 9 33	-1	—	—	30·3	12·6

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tortosa	55.6	297	9 48	+ 5	17 32	+ 3	24.8	34.7
Rio Tinto	61.9	296	18 40	?S	(18 40)	—	—	45.7
Coimbra	61.9	300	19 0	?S	(19 0)	+13	30.6	40.5
San Fernando	62.3	295	18 10	?S	(18 10)	-42	35.7	38.2
Victoria	89.9	12	41 56	?L	—	—	46.9	60.8
Ottawa	90.9	340	e 13 18	- 3	e 23 52	-31	46.7	—
Cape Town	91.0	224	53 34	?L	—	—	(53.6)	54.6
Toronto	93.4	342	—	—	—	—	e 57.7	58.8
Chicago	96.8	348	24 21	?S	(24 21)	-63	43.3	—
Washington w.	97.3	339	—	—	e 24 36	-53	—	—
Honolulu	100.6	50	e 26 22	?S	(e 26 22)	+21	60.7	65.7
Riverview	101.2	—	—	—	—	—	e 61.2	—
La Paz	141.0	297	19 47	[+ 6]	34 3	?	73.7	76.2

Additional records: Lemberg gives $iS = +16m.8s.$, $e = +23m.22s.$
 Zi-ka-wei MN = +23.2m., $T_0 = 2h.3m.30s.$ Athens MN = +27.1m., $T_0 = 2h.3m.22s.$
 Hamburg $SR_1 = +19m.29s.$, MN = +26.6m., MZ = +31.8m., $T_0 = 2h.3m.21s.$
 Kobe LN = +29.4m. Manila MN = +32.5m. Osaka MN = +29.6m.
 Strasbourg $SR_1 = +19m.36s.$, $T_0 = 2h.3m.23s.$ De Bilt $PR_1E = +10m.57s.$, $SR_1E = +19m.31s.$, $eN = +19m.47s.$, MN = +29.7m., $T_0 = 2h.3m.27s.$, epicentre $42^\circ 1'N.$ $78^\circ 0'E.$ Moncalieri MN = +30.7m., $T_0 = 2h.3m.34s.$
 Uccle $SR_1 = +20m.0s.$, MN = +30.2m., $T_0 = 2h.3m.17s.$ Besancon $T_0 = 2h.3m.26s.$ Paris $T_0 = 2h.3m.29s.$ Eskdalemuir $SR_1 = +21m.7s.$, $T_0 = 2h.3m.25s.$ Oxford $PR_1 = +12m.35s.$, $i = +21m.0s.$
 Barcelona $T_0 = 2h.3m.22s.$ Coimbra S = +26m.4s., MN = +40.3m. San Fernando S = +26m.40s., MN = +40.2m. Ottawa $eN = +17m.4s.$, $eLE = +42.2m.$, L = +51.7m. + 56.7m., and + 61.7m. Toronto E = +44m.22s. and +53m.46s., $eL = +72.5m.$ Chicago S = +31m.50s., L = +55.7m.

July 24d. 4h. 43m. 55s. Epicentre $1^\circ 58'. 76^\circ 0'W.$

A = +.242, B = -.970, C = -.026; D = -.970, E = -.242;
 G = -.006, H = +.025, K = -1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	16.9	153	i 4 10	+ 6	i 7 33	+17	8.7	10.9
Cipolletti	38.2	170	18 29	?L	—	—	24.8	27.9
Chicago	44.5	349	?8 23	- 7	?14 9	-60	?18.4	—
Bidston	81.1	37	35 35	?	40 11	?L	(40.2)	47.3
Uccle	85.1	40	—	—	e 23 24	- 4	e 39.1	45.1
De Bilt	85.7	39	—	—	e 23 29	+ 2	e 43.1	46.0
Helwan	105.8	59	45 5	?L	—	—	(45.1)	—

La Paz gives $T_0 = 4h.43m.53s.$ De Bilt $eLN = -39.1m.$, MN = +43.9m.
 Helwan PN = +46m.5s.

July 24d. 20h. 46m. 30s. Epicentre $24^\circ 0'N.$ $121^\circ 0'E.$ (as on 1919 July 18d.).

A = -.470, B = +.783, C = +.407.

	Δ	P.	O-C.	L.	M.
	°	m. s.	s.	m.	m.
Taihoku	1.1	e 0 15	- 2	0.5	—
Zi-ka-wei	7.2	2 29	+40	—	3.4

Zi-ka-wei gives MN = +3.5m.

July 24d. Records also at 1h. (Pompeii), 2h. (Ootomari), 4h. (Batavia, Riverview, Manila, and La Paz), 8h. (La Paz), 11h. (Taihoku and Manila), 17h. (Rio Tinto), 20h. (San Fernando).

July 25d. 3h. 17m. 50s. Epicentre $38^\circ 5'N.$ $22^\circ 5'E.$ (as on 1917 Mar. 14d.).

Athens ($\Delta = 1^\circ 2'$) gives $eP = +16s.$, L = +18s., M = +20s. Also $eL = +29s.$, M = +31s.

July 25d. 3h. 43m. 0s. Close to Tokyo which gives P = +11s., S = +25s. Perhaps $35^\circ 0'N.$ $139^\circ 5'E.$ (as on 1918 June 26d.).

July 25d. 18h. 56m. 0s. Epicentre $10^{\circ}0'N$. $103^{\circ}0'W$?

A = -0.171, B = -0.970, C = +0.174; D = -0.974, E = +0.225;
G = -0.039, H = -0.169, K = -0.985.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Chicago	34.5	21	7 10	+ 1	12 48	0	18.8	—
Washington	37.0	36	e 9 0	?PR ₁	13 14	-10	—	—
Toronto	39.4	28	—	—	—	—	17.8	—
Victoria	42.0	340	—	—	—	—	20.6	24.6
La Paz	43.5	128	e 8 18	- 4	14 52	- 3	21.5	28.1
Honolulu	53.9	290	e 17 42	?S	(17 42)	+34	25.0	30.5
Cipolletti	57.3	149	—	—	—	—	31.1	33.6
Edinburgh	87.2	35	—	—	—	—	45.0	—
San Fernando N.	89.5	53	48 0	?L	—	—	(48.0)	—
De Bilt	93.0	36	—	—	—	—	e 45.0	50.4
Hamburg	95.1	33	—	—	—	—	e 52.0	—
Helwan	120.8	45	e 74 0	?L	—	—	(e 74.0)	—

Toronto L = +23.6m. De Bilt MN = +50.9m. Helwan gives PN = +76m.0s.

July 25d. Records also at 0h. (San Fernando), 6h. (Berkeley), 15h. (Apia), 16h. (Colombo), 17h. (Georgetown), 22h. (Barcelona), 23h. (Mizusawa).

July 26d. 13h. 47m. 40s. Epicentre $35^{\circ}0'N$. $143^{\circ}0'E$. (as on 1918 July 25d.).

A = -0.654, B = +0.493, C = +0.574.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	2.8	285	0 12	-32	1 6	-11	—	—
Mizusawa E.	4.4	340	1 31	+23	2 53	+52	—	—
N.	4.4	340	1 35	+27	2 58	+57	—	—
Osaka	6.2	270	1 36	+ 1	—	—	2.3	3.1

It is not easy to reduce these residuals much by changes in adopted elements, and it seems a fair presumption that the shock is preliminary to that of August 3.

July 26d. Records also at 4h.16m. (close to Mizusawa), 5h.43m. (close to Mizusawa), 9h.17m. (near Tokyo and Mizusawa, possibly as at 13h.), 11h. (Helwan), 20h. (Perth), 22h. (San Fernando).

July 27d. 21h. 49m. 10s. Epicentre $36^{\circ}0'N$. $134^{\circ}0'E$.

A = -0.562, B = +0.582, C = +0.588.

A position near $34^{\circ}0'N$. $138^{\circ}0'E$. would suit equally well, but is nearer Tokyo, where the shock was not recorded.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Kobe	1.6	0 35	+11	—	—	1.2	—
Osaka	1.8	0 32	+ 4	—	—	1.2	1.9
Mizusawa E.	6.4	1 38	0	2 22	-33	—	—

July 27d. Records also at 0h. (San Fernando), 13h. (Colombo), 18h. (Mizusawa), 19h. (Rio Tinto), 20h. (San Fernando).

July 28d. Records at 7h. (Helwan), 9h., 10h., 11h. (Apia), 12h. (Strasbourg and Paris), 13h. (Bidston), 14h. (Florence), 19h. (Apia).

July 29d. 13h. 27m. 40s. At $8^{\circ}0'S$. $105^{\circ}0'E$. (as on 1918 Aug. 12.).

A = -0.256, B = +0.956, C = -0.139.

	Δ	Az.	P.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m.	m.
Batavia	2.6	45	e 0 41	0	—	1.3
Sydney	19.7	128	8 56	- 9	13.9	14.5
Riverview	19.7	128	9 20	15	—	13.9

Manila (27.6) records e 40s., which must refer to a separate shock. No way of reconciling all three records suggests itself.

July 29d. 19h. 25m. 0s. Epicentre $33^{\circ}3'N$. $9^{\circ}0'W$. (as on 1918 April 1d.).

A = +.826, B = -.131, C = +.549; D = -.156, E = -.988;

G = +.542, H = -.086, K = -.836.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
San Fernando	3.9	35	1 12	+11	—	—	2.0	2.8
Tortosa	10.7	42	1 42	-62	—	—	4.0	5.0
Barcelona	12.0	44	—	—	—	—	e 5.3	5.8
Rocca di Papa	19.2	57	—	—	—	—	e 11.2	—
Strasbourg	19.7	34	—	—	e 9 0	+43	—	—
Uccle	20.1	26	—	—	e 9 18	+53	—	—
De Bilt E.	21.4	24	—	—	e 9 36	+43	e 10.6	12.9

The S observations of Strasbourg, Uccle, and De Bilt suggest a more distant epicentre, but the evidence of San Fernando and Tortosa is against this. Perhaps the 3 records in question, which are simply given as e, are not S records at all, but L. De Bilt gives MN = +13.8m.

July 29d. Records also at 0h. and 2h. (San Fernando), 14h. (Helwan), 15h. (La Paz), 18h. (Barcelona).

July 30d. Records at 0h. (Pompeii), 3h. and 4h. (Florence), 9h.46m. (close to Rocca di Papa and another close to Zurich recorded also at Strasbourg and Florence), 20h. (La Paz), 21h. (Zi-ka-wei), 22h. (Zi-ka-wei and Lick (2)), 23h. (San Fernando).

July 31d. 21h. 52m. 50s. Epicentre $53^{\circ}5'N$. $159^{\circ}0'W$. (as on 1918 June 27d.).

A = -.555, B = -.213, C = +.804.

It seems impossible to reconcile the different records with a single shock. The above solution satisfies some of them approximately; others suggest another shock about three minutes later. The Strasbourg record is probably local (as on July 28), and a Lick ($\Delta = 30^{\circ}.3$) record iP = +23m.33s., M = +23.7m. is clearly local, and has been relegated to the final note for July 31.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Victoria	22.8	89	(5 35)	+20	—	—	5.6	7.9
Chicago	47.4	76	8 21	-29	15 45	-1	e 25.2	—
Toronto	50.7	67	(13 4)	+233	(19 40)	+193	19.7	—
Ottawa	51.6	63	12 22	+185	e 16 34	-5	e 19.2	—
Northfield	54.0	61	—	—	e 18 0	+51	—	—
Washington	55.3	70	9 52	+11	19 23	+118	—	—
Georgetown	55.3	70	e 12 53	+192	19 26	+121	—	—
Cheltenham	55.6	70	19 53	?8	(19 53)	+144	23.3	—
De Bilt	73.6	10	—	—	—	—	e 31.2	36.5
Uccle	74.7	11	—	—	—	—	e 32.2	—
Strasbourg	77.3	9	5 26	?	—	—	—	—

Ottawa iN = +13m.27s. The records for P and S were not assigned to them at the station. The same applies to Georgetown P and Northfield S. Cheltenham PN(=PS?) = +19m.55s. De Bilt MN = +35.8m.

July 31d. Records also at 0h. and 1h. (Rocca di Papa), 2h. (San Fernando and Zi-ka-wei), 3h. (Rocca di Papa), 5h. (La Paz), 7h. (Rocca di Papa, Honolulu, Melbourne, Riverview, Victoria, and Chicago), 8h. (La Paz, Toronto, Uccle, De Bilt, and Helwan), 19h. (Zi-ka-wei and Athens), 20h. (Hamburg, De Bilt, Uccle, Strasbourg, and San Fernando), 21h. (Strasbourg, Lick, and Berkeley), 23h. (Lick).

Aug. 1d. Records at 1h. (Manila), 5h. (Zi-ka-wei), 6h. (De Bilt), 7h. (Kingston and San Fernando), 13h. (Riverview), 14h. (Hamburg and Helwan).

Aug. 2d. Records at 0h. (San Fernando and La Paz), 3h. (Simla), 10h. (Bidston), 11h.7m. (close to Tokyo), 15h.42m. (close to Tokyo), 16h. (Taihoku), 18h. (Simla), 22h. (Chicago).

Aug. 3d. 9h. 45m. 0s. Epicentre $31^{\circ}5'N$. $19^{\circ}5'E$.

$$A = +.804, B = +.285, C = +.523; \quad D = +.334, E = -.943; \\ G = +.492, H = +.174, K = -.853.$$

This epicentre fits the observations, but lies sensibly to the S.W. of the usual region. A mistake in any of the records would modify it considerably, e.g. if the Athens P is really S.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	7.3	28	1 56	+ 5	—	—	2.5	3.1
Pompeii	10.1	338	e 2 45	+14	e 3 30	-62	—	15.0
Helwan	10.3	96	11 0	?	—	—	—	—
Rocca di Papa	11.6	334	e 2 54	+ 1	5 12	+ 3	—	5.7
Vienna	16.9	353	—	—	e 7 6	-10	—	8.3
Hamburg	23.1	346	—	—	e 11 0	?L	(e 11.0)	—
De Bilt	23.1	337	—	—	—	—	e 11.0	13.1

Additional records: Athens MN = +2.8m. Helwan PN = +15m.0s. De Bilt MN = +12.5m. Pompeii gives its record 1m. late.

Aug. 3d. 18h. 8m. 40s. Epicentre $35^{\circ}0'N$. $143^{\circ}0'E$. (as on 1919 July 26d.).

$$A = -.654, B = +.493, C = +.574; \quad D = +.602, E = +.799; \\ G = -.458, H = +.345, K = -.819.$$

The La Paz residual suggests a high focus, but there is no support elsewhere.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	2.8	285	0 40	- 4	1 8	- 9	—	—
Mizusawa	4.4	340	1 20	+12	2 27	+26	—	—
Osaka	6.2	270	1 41	+ 6	—	—	3.0	3.8
Kobe	6.4	266	1 42	+ 4	—	—	3.0	3.8
Ootomari	11.6	359	5 10	?S	(5 10)	+ 1	7.8	8.8
Taihoku	21.0	247	8 33	?S	(8 33)	-11	14.0	—
Manila	28.5	230	e 7 34	+81	—	—	—	—
Honolulu	53.0	88	—	—	—	—	34.3	39.3
Colombo	64.2	260	39 20	?L	—	—	(39.3)	43.3
Hamburg	82.6	335	—	—	e 22 20	-33	e 42.3	47.3
Vienna	84.1	328	12 47	+ 4	—	—	e 46.3	—
Edinburgh	84.7	342	—	—	—	—	44.3	55.3
Eskdalemuir	85.1	341	—	—	e 23 15	- 5	43.3	—
De Bilt	85.4	336	—	—	23 18	- 5	e 44.3	53.2
	N.	336	—	—	23 19	- 4	e 45.3	52.7
Uccle	86.7	336	e 13 2	+ 5	e 23 20	-18	e 43.3	55.1
Bidston	86.8	340	43 50	?L	—	—	(43.8)	53.7
Strasbourg	87.4	331	—	—	e 23 30	-15	e 45.3	—
Kew	87.7	338	—	—	—	—	—	56.3
Helwan	88.6	306	—	—	24 20	+21	—	—
Paris	89.1	335	—	—	—	—	e 48.3	56.3
Chicago	90.3	37	—	—	e 24 20	+ 3	41.3	—
Rocca di Papa	90.7	326	17 17	?PR ₁	27 5	+164	e 51.8	58.4
Barcelona	95.5	331	e 42 50	?	—	—	e 51.6	55.9
San Fernando	E. 103.0	335	59 20	?L	—	—	(59.3)	85.3
	N. 103.0	335	56 50	?L	—	—	(56.8)	87.3
La Paz	146.6	65	20 28	[+37]	—	—	—	—

Additional records: Mizusawa SN = +2m.23s. Osaka MN = +3.7m.
 Kobe MN = +3.3m. Ootomari gives S = +6m.55s. (?L). Hamburg
 MZ = +54.3m., MN = +55.6m. De Bilt SR₁N = +29m.32s. Uccle SR₁ =
 +29m.20s., MN = +46.3m. Strasbourg eL = +49.3m. Chicago L =
 +51.3m.

Aug. 3d. 20h. 27m. 8s. Epicentre $35^{\circ}0'N$. $143^{\circ}0'E$. (as at 18h.).

	Δ	P.	O-C.	S.	O-C.	M.
		m. s.	s.	m. s.	s.	m.
Tokyo	2.8	0 48	- 4	0 57	-20	—
Mizusawa	E. 4.4	0 46	-22	2 4	+ 3	—
Osaka	6.2	2 4	+29	—	—	3.5

Aug. 3d. 20h. 53m. 7s. Epicentre $35^{\circ}\cdot 0\text{N}$. $143^{\circ}\cdot 0\text{E}$. (as at 20h. 27m.).

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tokyo		2·8	0 36	- 8	1 15	- 2	—	—
Mizusawa	E.	4·4	1 8	0	2 9	+ 8	—	—
	N.	4·4	1 12	+ 4	2 13	+ 12	—	—
Osaka	E.	6·2	2 0	+ 25	—	—	3·0	3·7
Batavia		53·5	8 48	- 42	9 3	?	—	—

Osaka gives MN = +4·0m. The Batavia record probably refers to a local shock.

Aug. 3d. 21h. 15m. 52s. Epicentre $35^{\circ}\cdot 0\text{N}$. $143^{\circ}\cdot 0\text{E}$. (as at 20h., &c.).

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tokyo		2·8	285	0 44	0	0 58	- 19	—	—
Mizusawa	E.	4·4	340	1 20	+ 12	2 9	+ 8	—	—
De Bilt		85·4	336	—	—	—	—	e 27·1	30·4
Uccle		86·7	336	—	—	—	—	e 23·1	29·1
Helwan		88·6	306	34 8	?L	—	—	(34·1)	—

Mizusawa gives SN = +2m.8s. De Bilt MN = +29·9m. Helwan PN (-LN?) = 38·1m. But the last three records almost certainly refer to some other shock.

Aug. 3d. Records also at 0h. (Perth), 1h. (Rocca di Papa), 2h. (San Fernando), 3h. (La Paz and Kodaikanal), 6h. (Batavia), 9h. (Florence), 11h. (Helwan), 14h. (Manila), 16h. (Chicago, Vieques, Batavia, and Taihoku), 17h. (Helwan), 18h. (Colombo, Edinburgh, and Barcelona), 22h. (close to Tokyo and Taihoku).

Aug. 4d. Records at 3h. (La Paz and Helwan), 4h. (Tokyo), 19h. (San Fernando).

Aug. 5d. Records at 4h. (Riverview), 5h. (Apia and Melbourne), 6h. (Helwan and Rio Tinto), 9h. (Apia), 10h. (Manila), 20h. (La Paz), 22h. (Barcelona).

Aug. 6d. Records at 4h. (San Fernando), 5h. (Manila and Batavia), 11h. (close to Tokyo), 14h.-16h. (Florence), 16h. (Taihoku), 18h. (Manila, Batavia, following Manila as at 5h., De Bilt e 18h.34m.18s., Uccle e 18h.35m., Helwan and Strasbourg 18h.40m.).

Aug. 7d. 6h. 50m. 50s. Epicentre $24^{\circ}\cdot 0\text{N}$. $121^{\circ}\cdot 0\text{E}$. (as on 1919 July 24d.).

A = -·470, B = +·783, C = +·407; D = +·857, E = +·515;
G = -·210, H = +·349, K = -·914.

	Δ °	Az. °	P. m. s.	O - C. s.	L. m.	M. m.
Taihoku	1·1	24	0 15	- 2	0·6	0·6
Hokoto	1·3	251	0 32	+ 12	1·3	—
Zi-ka-wei	7·2	3	e 1 34	- 15	—	4·1
Helwan	77·9	297	52 10	?	—	—
Hamburg	82·3	327	e 42 10	?L	(e 42·2)	52·2
De Bilt	85·6	326	—	—	e 44·2	54·7
Edinburgh	87·2	332	—	—	54·2	—

Additional records: Zi-ka-wei MN = +3·8m. Helwan PN = +51m.10s.
De Bilt MN = +56·0m.

Aug. 7d. 16h. 31m. 25s. Epicentre $38^{\circ}5'N$. $146^{\circ}0'E$. (as on 1918 June 1d.).

A = -649, B = +438, C = +622; D = +559, E = +829;
G = -516, H = +348, K = -783.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	3.8	274	0 56	- 3	1 40	- 4	—	—
Tokyo	5.7	243	1 18	-10	2 37	+ 1	4.0	4.7
Osaka	9.3	249	2 44	+24	—	—	4.4	5.2
Zi-ka-wei	21.3	259	—	—	e 9 39	+49	—	—
Hamburg	80.4	335	—	—	—	—	e 41.6	51.6
Eskdalemuir	82.6	343	—	—	—	—	44.6	—
Edinburgh	82.1	343	—	—	—	—	46.6	—
De Bilt	83.8	337	—	—	22 45	-22	e 41.6	47.3
Uccle	84.6	337	—	—	—	—	e 44.6	—
Helwan	88.4	308	24 35	?S	(24 35)	+39	—	—
Rocca di Papa	89.1	327	—	—	—	—	e 49.3	58.3
San Fernando	100.8	338	52 35	?L	—	—	(52.6)	—

Additional records: Mizusawa SN = +1m.36s. Osaka MN = +5.4m.
De Bilt eLN = +43.6m., MN = +55.8m. Helwan PN = +23m.35s. (?S).

Aug. 7d. Records also at 0h. (San Fernando), 8h. (La Paz and Edinburgh),
10h. (close to Apia), 16h. (Mizusawa (2)).

Aug. 8d. 5h. 1m. 10s. Epicentre $21^{\circ}0'S$. $67^{\circ}0'W$. (as on 1917 Nov. 2d.).

A = +365, B = -860, C = -358; D = -920, E = -391;
G = -140, H = +330, K = -934.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
La Paz	4.6	345	i 1 26	+15	—	—	2.2	2.9
Andalgala	6.6	176	—	—	—	—	6.4	8.0
Pilar	11.1	166	5 26	?S	(5 26)	+29	6.4	17.5
Mendoza	12.0	186	(3 26)	+27	(5 44)	+25	5.7	(5.9)
Cipolletti	18.0	183	—	—	(6 32)	-68	6.5	10.6
Washington	60.6	351	10 12	- 4	18 14	-17	—	—
Chicago	65.6	344	10 28	-21	19 1	-31	e 31.8	—
Coimbra	82.0	41	e 13 24	+54	22 25	-21	e 40.3	—
Granada	83.3	47	e 12 43	+ 5	i 24 0	+60	—	—
Tortosa	88.0	45	13 15	+10	23 32	-20	37.8	—
Barcelona	89.3	45	—	—	(e 23 33)	-33	e 23.6	—
Bidston	92.5	34	23 11	?S	(23 14)	-86	—	39.8
Eskdalemuir	93.4	29	—	—	23 40	-69	39.8	—
Edinburgh	93.7	30	—	—	23 58	-55	40.8	—
Uccle	95.1	38	—	—	e 24 4	-63	e 43.8	—
Strasbourg	96.1	40	—	—	e 24 14	-63	e 43.8	—
De Bilt	E. 96.1	36	—	—	24 3	-74	e 48.8	50.0
N. 96.1	36	—	—	—	—	—	e 49.8	51.4
Rocca di Papa	96.5	49	e 24 14	?S	(e 24 14)	-67	—	27.3
Helwan	107.2	64	—	—	26 50	-13	—	—

Additional records: La Paz gives MN = +2.2m. Pilar MN = +8.5m.
Mendoza. All the records have been increased by 4m.0s. Chicago L =
+34.8m. and +41.3m. Coimbra eLN = +35.3m. Bidston gives
S as P. Eskdalemuir gives S as P, with S = +30m.44s. Edinburgh
S as P, with S = +31m.15s. Rocca di Papa gives S as P. Granada
iP = +12m.59s., i = +22m.59s. Helwan gives S as P, with PN =
+23m.50s.

Aug. 8d. Records also at 0h. (San Fernando), 4h. (La Quiaca), 8h. (Apia), 12h.
(Mizusawa), 13h. (Apia and Manila), 20h. (Rocca di Papa).

Aug. 9d. 12h. 25m. 35s. Epicentre $21^{\circ}0'S$. $67^{\circ}0'W$. (as on Aug. 8d.).

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
La Paz	4.6	1 24	+13	—	—	2.1	2.3
Mendoza	12.0	4 25	+86	—	—	—	7.9
Uccle	95.1	—	—	e 24 1	-66	—	—
Strasbourg	96.1	—	—	22 25	-172	30.4	—
De Bilt	96.1	—	—	24 6	-71	49.4	—

Aug. 9d. 14h. 38m. 0s. Epicentre $48^{\circ}5'N$. $28^{\circ}0'E$?

$$A = +.585, B = +.311, C = +.749.$$

The adopted epicentre lies outside the usual region, and the solution is otherwise unsatisfactory, for the residuals suggest a position nearer Vienna and Rocca di Papa, but further from the other stations, which are inconsistent requirements.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Vienna	7.7	e 1 46	-11	—	—	e 3.5	5.4
Strasbourg	12.0	—	—	e 6 0	+41	—	—
Hamburg	12.4	—	—	e 6 0	+31	—	—
Rocca di Papa	12.7	3 6	-3	—	—	—	4.5
De Bilt	15.0	—	—	e 6 54	+22	e 7.6	8.8
Uccle	15.4	—	—	e 8 0	?L	(e 8.0)	—

De Bilt MN = +9.1m.

Aug. 9d. 22h. 41m. 30s. Epicentre $33^{\circ}3'N$. $9^{\circ}0'W$. (as on 1919 July 29d.).

$$A = +.826, B = -.131, C = +.549; \quad D = -.156, E = -.988; \\ G = +.542, H = -.086, K = -.836.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Granada	5.9	47	2 11	+40	2 53	+12	i 3.1	—
Coimbra	6.9	4	e 5 15	+210	6 7	+180	6.8	7.2
Algiers	10.5	67	1 32	-65	—	—	2.2	2.2
Tortosa	10.7	42	2 10	-30	—	—	3.1	4.2
Barcelona	12.0	44	e 3 12	+13	—	—	3.6	4.4
Rocca di Papa	19.2	57	e 3 33	-58	—	—	e 8.0	11.0
Oxford	19.4	15	—	—	—	—	9.2	10.3
Strasbourg	19.7	34	—	—	—	—	e 8.3	9.9
Uccle	20.1	26	—	—	—	—	e 7.9	9.5
De Bilt	21.4	24	—	—	—	—	e 8.9	12.8
Edinburgh	23.0	9	—	—	—	—	11.3	13.3
Hamburg	24.4	28	—	—	—	—	e 11.5	—
Helwan	34.4	84	19 30	?L	—	—	(19.5)	—

Additional records: De Bilt LN = +10.1m. Helwan PN = +18m.30s.

Aug. 9d. Records also at 0h. (San Fernando and Lemberg), 4h. (La Paz), 5h. (Denver), 7h. (Edinburgh), 11h. (Vieques), 12h. (Helwan), 13h. (close to La Quiaca and Helwan).

Aug. 10d. Records at 3h. (Denver and San Fernando), 7h. (Taihoku), 14h. (Helwan), 20h. (San Fernando), 21h. (La Paz).

Aug. 11d. 5h. 5m. 0s. Epicentre $51^{\circ}5'S$. $75^{\circ}5'W$.

$$A = +.156, B = -.603, C = -.783.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
La Paz	35.5	10	7 16	-2	13 0	-3	17.4	19.1
Uccle	122.5	48	—	—	—	—	—	67.0
Helwan	123.0	83	S1 0	?	—	—	—	—
De Bilt	E. 123.7	47	—	—	—	—	e 61.0	67.4
	N. 123.7	47	—	—	e 38 54	?SR ₁	65.0	67.5
Strasbourg	125.7	50	—	—	—	—	e 61.0	—

Helwan gives PN = +87m.0s. De Bilt gives eE = +43m.18s.

Aug. 11d. Records also at 7h. (Zi-ka-wei and Apia), 8h. (Colombo), 9h. (Simla), 11h. (La Paz), 13h. (Lemberg), 18h. (San Fernando), 23h. (San Fernando and Rocca di Papa).

Aug. 12d. Records at 10h. (Helwan), 14h. (Helwan), 16h. (La Paz), 18h. (San Fernando), 19h. (Taihoku), 22h. (Mizusawa).

Aug. 13d. 0h. 21m. 0s. Epicentre $39^{\circ}5'N$. $27^{\circ}0'W$. (as on 1919 July 18d.).

$A = +.687$, $B = -.350$, $C = +.636$; $D = -.454$, $E = -.891$;
 $G = +.567$, $H = -.289$, $K = -.772$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Azores	2.1	148	0 12	-21	—	—	—	2.3
Tortosa	21.2	77	2 24	-151	—	—	10.4	11.3
Edinburgh	22.7	36	—	—	10 0	+41	—	—
Ucele	24.6	52	—	—	e 10 48	+53	—	46.0
De Bilt	25.4	49	—	—	e 11 24	+73	—	13.8
E. N.	25.4	49	—	—	10 18	+7	—	13.6
Strasbourg	26.3	58	—	—	e 11 0	+32	—	16.3
Kingston	47.9	260	9 0	+7	—	—	—	—
Victoria	65.2	314	—	—	(20 0)	+33	20.0	—

If Azores record is 1m. too small, we can increase T_0 by 30—40sec., which will remove the greater part of the errors. Tortosa may also be 2m. in error.

Aug. 13d. Records also at 0h. (Riverview), 1h. (De Bilt), 2h. (San Fernando), 6h. (Rio Tinto), 12h. (Azores), 13h. (De Bilt), 20h. (Taihoku), 21h. (Helwan, San Fernando, and Berkeley), 22h. (Manila).

Aug. 14d. 7h. 59m. 30s. About 2° from Manila, which gives $eP = +25s.$, $L = +1.0m.$, $ME = +1.3m.$, $MN = +1.7m.$

Aug. 14d. 16h. 6m. 55s. About $0^{\circ}5'$ from Rocca di Papa, which records $eP = +8s.$, $S = +16s.$, $M = +0.3m.$

Aug. 14d. Records also at 0h. and 2h. (La Paz), 5h. (Mizusawa), 6h. (Manila), 13h. (close to Tokyo), 15h. (La Quiaca), 17h. (Kodaikanal), 21h. (San Fernando), 22h. (Lick and Rocca di Papa).

Aug. 15d. 2h. 6m. 30s. Epicentre $34^{\circ}6'N$. $140^{\circ}7'E$. (as on 1919 June 8d.).

$A = -.637$, $B = +.521$, $C = +.568$.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	1.3	0 7	-13	0 19	-17	—	—
Osaka	4.3	1 28	+21	—	—	2.5	3.4
Mizusawa	4.5	1 0	-10	—	—	—	—

Osaka gives $MN = +3.1m.$

Aug. 15d. 4h. 17m. 26s. Epicentre $31^{\circ}0'S$. $43^{\circ}0'W$.

$A = +.627$, $B = -.585$, $C = -.515$; $D = -.682$, $E = -.731$;
 $G = -.377$, $H = +.351$, $K = -.857$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Pilar	17.8	262	7 22	?S	(7 22)	-14	—	10.9
Andalgala	20.6	274	—	—	—	—	—	18.4
Cipolletti	22.0	242	4 40	-25	(6 10)	-175	6.2	7.5
La Paz	27.1	297	6 2	+3	11 4	+21	14.4	17.3
Chicago	83.5	329	12 39	0	22 49	-14	35.9	—
Strasbourg	91.8	31	e 16 34	+188	—	—	—	—
Ucele	91.8	28	e 16 34	+188	—	—	e 52.6	64.6
De Bilt	93.1	28	—	—	e 30 1	?SR ₁	e 58.6	64.7
Helwan	93.2	57	21 34	?S	(21 34)	?	—	—
Edinburgh	93.7	21	—	—	—	—	60.6	—
Vienna	95.3	35	e 13 13	-32	—	—	—	—
Hamburg	96.2	29	e 16 34	+164	—	—	—	—
Melbourne	110.8	187	—	—	—	—	41.6	46.6

Additional records: Strasbourg gives $e_1 = +14m.34s.$, $e_2 = +16m.34s.$ The former has been credited to the following shock. Ucele gives $e_1 = +29m.52s.$, $e_2 = +36m.34s.$ De Bilt gives $e(PR) = +17m.49s.$, $e = +37m.5s.$, $eLN = +63.6m.$, $MN = +67.5m.$ For Rocca di Papa and Pompeii see following shock.

Aug. 15d. 4h. 23m. 50s. About $11^{\circ}0$ from Rocca di Papa, which records $eP = +2m.41s.$, $S = +4m.50s.$, $M = +5.3m.$ Pompeii gives $eP = +2m.54s.$, $M = +4.5m.$ The record of this shock would perhaps obscure that of the previous shock. Again some of the European records, credited to the above shock, may be really due to this, but it is not easy to specify the epicentre for this. Query $37^{\circ}0N.0^{\circ}?$.

Aug. 15d. Records also at 0h. (San Fernando), 5h. (Hamburg and Helwan), 10h. (near Sidney and Riverview), 12h. (Lemberg), 14h. (Helwan), 15h. (Edinburgh and Manila), 17h. (Lemberg and Mizusawa), 19h. (Kingston), 23h. (Rocca di Papa, San Fernando, and Lick).

Aug. 16d. Records at 4h. (San Fernando), 8h. (Colombo), 11h.4m.50s. (about 1° from Taihoku, which gives $P = +28s.$, $L = +0.7m.$, $M = +1.2m.$), 12h. (Helwan), 15h. (Manila), 16h. (Helwan), 19h. (Mizusawa), 21h. (Zurich), 22h. (Batavia).

Aug. 17d. Records at 2h. (San Fernando and Batavia), 5h., 8h., and 14h. (Helwan), 17h. (Nagasaki), 18h. (Mizusawa), 19h. (La Quiaca and La Paz.).

Aug. 18d. 11h. 17m. 30s. Epicentre $51^{\circ}0N. 34^{\circ}0W.$ (as on 1917 April 20d.).

$A = +.521$, $B = -.352$, $C = -.777$; $D = -.559$, $E = -.829$;
 $G = +.644$, $H = -.434$, $K = -.629$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Edinburgh	18.3	63	—	—	8 30	+43	—	—
Uccle	23.9	75	—	—	—	—	e 10.7	—
De Bilt	24.1	72	—	—	e 9 40	- 6	e 11.5	13.8
Hamburg	26.6	67	e 8 20	+146	—	—	14.0	15.5
Strasbourg	26.6	79	—	—	—	—	e 12.6	—
Rocca di Papa	32.9	88	e 8 49	+113	—	—	—	11.3
Pompeii	34.6	88	8 11	+61	—	—	—	10.8
Chicago	37.2	279	—	—	e 13 30	+ 3	e 19.2	—
Helwan	52.1	89	17 30	?8	(17 30)	+45	—	—

De Bilt gives $MN = +14.3m.$

Strasbourg gives its record 1h. wrong.

Pompeii gives its record 1h. late.

Helwan gives $PN = +18m.30s.$

1919. Aug. 18d. 16h. 55m. 25s. Epicentre $17^{\circ}0S. 177^{\circ}5W.$
 (as on 1918 May 22d.).

$A = -.955$, $B = -.042$, $C = -.292$; $D = -.044$, $E = +.999$;
 $G = +.292$, $H = +.013$, $K = -.955$.

(The same focal depth 0.050 has been assumed as on 1918 May 22, but seems rather excessive).

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Apia		-0.1	6.3	61	i 1 57	+19	—	3.5	—
Sydney	E.	-3.4	32.7	232	3 29	-172	5 23	-359	8.2
Riverview		-3.4	32.7	232	e 5 52	-29	i 11 32?	+10	12.5
Melbourne		-3.9	38.9	230	6 35	-38	—	—	14.6
Honolulu		-4.3	42.8	29	8 17	-25	i 14 5	+20	e 20.6
Perth		-5.6	61.6	242	9 27	-19	—	—	17.2
Tokyo		-5.8	66.4	324	9 33	-43	e 18 3	-28	31.4
Mizusawa	E.	-5.8	68.1	328	10 43	+16	19 22	+30	—
	N.	-5.8	68.1	328	10 44	+17	19 29	+37	—
Osaka		-5.8	68.3	320	10 45	+16	—	—	19.5
Manila		-5.9	68.4	295	e 10 41	-12	15 44	-191	19.3
Kobe	E.	-5.9	68.5	320	10 39	+10	—	—	19.4
Taihoku		-6.0	72.7	306	11 18	+22	—	—	20.1
Ootomari		-6.0	73.0	334	11 22	-24	—	—	20.6
Batavia		-6.1	74.5	269	11 10	+3	i 20 13	- 6	e 32.6
Berkeley	N.	-6.1	75.4	41	e 11 27	+14	e 20 53	+35	—
	E.	-6.1	75.4	41	e 11 30	+17	e 20 52	+34	—
Zi-ka-wei		-6.1	75.9	311	e 11 27	+11	20 47	+23	—
Victoria		-6.2	81.2	33	—	—	—	—	21.7
Cipolletti		-6.5	93.6	133	—	—	24 53	+71	(24.9)

Continued on next page.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Andalgala	-6.7	99.8	125	—	—	—	—	—	31.1
Pilar	-6.7	99.9	130	—	—	—	—	—	27.2
Calcutta	E. -6.7	100.1	290	23 23	? S	(23 23)	-86	—	—
Chicago	-6.8	101.1	50	10 24	?	23 30	-89	35.6	—
La Paz	-6.8	102.7	112	e 17 45	? PR ₁	23 32	-103	27.0	27.6
Ann Arbor	-6.9	104.0	50	25 5?	? S	(25 5?)	-22	44.6	—
Colombo	E. -6.9	104.1	271	23 35	?	25 35	+ 7	29.4	30.6
Toronto	-7.0	107.3	49	—	—	—	—	36.1	38.3
Washington	-7.0	108.5	53	—	—	e 25 40	-30	44.4	—
Ithaca	-7.0	109.3	48	e 20 11	? PR ₁	25 50	-28	33.7	—
Ottawa	-7.1	110.1	46	—	—	i 26 7	-17	44.2	—
Simla	-7.1	111.5	298	e 26 11	? S	(e 26 11)	-26	—	34.5
Mauritius	E. -7.2	114.2	237	19 41	? PR ₁	—	—	—	47.4
Cape Town	—	126.9	196	39 17	?	—	—	—	41.9
Edinburgh	—	140.9	5	40 25	?	46 8	?	54.6	—
Eskdalemuir	—	141.4	6	18 55	[-47]	28 38	-153	44.6	—
Lemberg	—	142.8	358	e 18 59	[-46]	e 28 41	-159	e 67.7	69.9
Hamburg	—	142.9	352	i 19 6	[-39]	i 28 51	-149	e 46.6	—
De Bilt	—	144.8	357	19 14	[-34]	e 32 47	+76	—	90.1
Kew	—	145.5	3	—	—	—	—	—	42.6
Uccle	—	146.2	358	e 19 16	[-34]	i 29 6	-152	—	—
Vienna	—	146.8	341	i 19 12	[-39]	i 29 12	-149	44.6	65.6
Strasbourg	—	148.1	351	19 26	[-27]	—	—	—	—
Paris	—	148.2	1	e 19 27	[-26]	i 29 21	-147	38.6	—
Zurich	—	149.2	351	e 19 21	[-33]	—	—	—	—
Helwan	—	150.7	302	19 53	[-4]	—	—	—	44.6
Florence	—	152.2	346	—	—	—	—	4.6	—
Rocca di Papa	—	153.7	343	e 19 19	[-42]	19 55	[-6]	—	20.0
Pompeii	—	154.1	339	e 19 27	[-34]	29 27	?	—	—
Coimbra	—	154.9	21	19 48	[-14]	28 24	?	36.9	—
Barcelona	—	155.5	0	e 19 52	[-10]	29 57	?	—	44.0
Tortosa	—	156.1	5	18 47	[-76]	29 58	?	43.6	43.7
Granada	—	159.1	14	e 19 29	[-38]	i 33 43	?	—	—
San Fernando	—	159.1	20	23 35	? PR ₁	30 5	?	45.6	53.6

Additional records: Apia has been corrected by -1h. Riverview gives eP = +5m.58s., iPR₁ = +7m.11s. and +7m.28s., i = +13m.6s., MN = +13.5m., T₀ = 16h.55m.17s. Melbourne gives SR₁ = +10m.11s. Osaka MN = +20.4m. Berkeley ePV = +11m.29s., T₀ = 16h.55m.26s. Chicago L = +55.1m. Ann Arbor PN = +25m.17s. Toronto L = +30.0m., eL = +58.5m. Ithaca SN = +25m.53s., L = +28.8m. Ottawa iN = +20m.53s., eE = +20m.55s., iN = 38m.3s. and +44m.13s., eL = +47.2m., LE = +64.6m. Eskdalemuir PR = +22m.20s. Lemberg iPR₁ = +22m.15s., ePR₃ = +24m.53s., eSR₁ = +32m.11s., eSR₂ = +34m.53s., +37m.35s., and +40m.17s. De Bilt iPRN = +29m.1s., eN = +32m.23s., MN = +76.3m. Uccle PR₁ = +22m.47s. Vienna PR₁ = +23m.1s., SR₂ = +38m.59s., SR₃ = +39m.54s. Strasbourg iPR₁ = +28m.31s. Paris ePN = +19m.21s. Helwan PN = +22m.17s., MN = +42.3m. Florence simply gives 17h. to 19h. Coimbra LN = +35.8m. Granada i = +20m.15s.

Aug. 18d. 20h. 52m. 0s. Repetition from 17° 0S. 177° 5W. (as at 16h.?).

(Reduced with same elements as at 16h.).

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Sydney	-3.4	32.7	232	5 12	-69	—	—	9.8	11.0
Riverview	-3.4	32.7	232	—	—	e 11 24)	+ 2	e 11.4	16.6
Melbourne	-3.9	38.9	230	—	—	13 0	+ 5	15.1	18.8
Berkeley	6.1	75.4	41	—	—	—	—	e 37.0	—
Chicago	6.8	101.1	50	—	—	—	—	e 52.0	—
De Bilt	—	144.8	357	—	—	—	—	e 88.0	—
Uccle	—	146.2	357	—	—	—	—	e 86.0	91.0
Helwan	—	150.7	302	33 0	? S	—	—	—	—

Additional records: Riverview gives MN = +13.4m. Chicago L = +58.0m. and +64.0m. Helwan a later PE = +88.0m., PN = +91.0m., which might possibly refer to some phase of the above shock.

Aug. 18d. Records also at 0h. (Athens), 1h. and 3h. (San Fernando), 4h. (Taihoku), 5h. (Toronto), 7h. (Helwan), 8h. (De Bilt and Hamburg), 12h. (Pompeii and Strasbourg), 17h. (La Paz, Marseilles, and Taihoku), 19h. (Rio Tinto), 20h. (Colombo).

Aug. 19d. 14h. 20m. 55s. Epicentre $18^{\circ}5'N$. $120^{\circ}0'E$ (as on 1917 Sept. 17d.).

$$A = -.474, B = +.821, C = +.309.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	4.0	e 0 53	- 9	---	---	1.8	2.2
Taihoku	7.2	1 56	+ 7	---	---	2.9	---
Zi-ka-wei	12.8	---	---	e 6 9	+30	---	---

Manila gives $MN = +2.3m$., and suggests as epicentre $18^{\circ}8'N$. $121^{\circ}0'E$. But the residuals favour a position further South, say $17^{\circ}5'N$. or $18^{\circ}0'N$.

Aug. 19d. 20h. 17m. 20s. Epicentre $35^{\circ}2'N$. $34^{\circ}7'E$. (as on 1918 Sept. 29d.).

$$A = +.672, B = +.465, C = +.576; \quad D = +.569, E = -.822;$$

$$G = +.474, H = +.328, K = -.817.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Helwan	6.0	209	7 40	?M	---	---	---	---
Athens	9.2	291	---	---	e 6 5	+117	i 7.1	7.6
Lemberg	16.6	335	e 6 16	?S	(e 6 16)	-53	8.8	12.3
Budapest	17.0	321	16 34	?M	---	---	---	---
Rocca di Papa	18.4	298	e 4 47	+25	e 8 28	+39	e 11.3	13.7
Vienna	18.8	320	e 4 34	+ 7	7 54	- 4	e 10.6	15.1
Strasbourg	24.1	311	e 5 19	-10	e 10 1	+15	e 13.7	---
Hamburg	25.2	324	e 6 28	+48	---	---	e 14.3	16.7
Uccle	26.9	315	---	---	10 30	- 9	e 14.7	---
De Bilt	26.9	318	---	---	10 31	- 8	e 13.7	17.9
Tortosa	27.3	290	6 39	+38	11 13	+27	12.6	20.7
Kew	29.7	314	---	---	---	---	---	22.7
Eskdalemuir	32.8	320	---	---	e 12 0	-21	18.7	---
Edinburgh	33.0	321	19 40	?M	---	---	---	---

De Bilt gives $iN = +10m.36s$., $MN = +16.2m$. Helwan $PN = +9m.40s$. The solution fits certain stations (Vienna, Strasbourg, Uccle, De Bilt) fairly well, but other records are puzzling, especially those nearest the adopted epicentre, which suggests an origin much further away. It is not, however, easy to satisfy the two sets of conditions.

Aug. 19d. Records also at 0h. (Eskdalemuir, De Bilt, Uccle), 1h. (Sydney and Melbourne), 2h. (close to Balboa Heights), 3h. (Taihoku and Helwan), 4h. (Kew), 5h. (Taihoku and Rocca di Papa), 6h. (Kobe), 7h. (Rio Tinto), 9h. (Apia), 11h. (close to Athens), 21h. (Rocca di Papa and Florence (3)), 22h. (La Paz).

Aug. 20d. 3h. 58m. 0s. Close to Rocca di Papa, which gives $P = +25s$., $S = +43s$., $M = 51s$. Pompeii gives $eP = +29s$.

Aug. 20d. 11h. 12m. 30s. Close to Batavia, which gives $P = +24s$., $S = M = +40s$., and notes Malabar $iS - P = 15s$.

Aug. 20d. 19h. 32m. 10s. Close to Rocca di Papa, which gives $eP = +8s$., $M = +2.5m$. Pompeii gives $eP = +59s$., $eS = +1m.39s$.

Aug. 20d. Records also at 0h. (San Fernando), 9h. (Melbourne), 10h. (Colombo and Helwan), 15h. (Helwan), 21h. (San Fernando), 23h. (Taihoku (2) and Zi-ka-wei).

Aug. 21d. 9h. 39m. 15s. Close to Manila, which gives $eP = +17s$., $L = +34s$., $MN = +37s$.

Aug. 21d. 12h. 28m. 30s. Close to Taihoku, which gives $P = +14s.$, $L = +29s.$, $M = +30s.$

Aug. 21d. Records also at 4h. (close to Tokyo), 7h. (Rio Tinto and Batavia), 8h. (Helwan and Rio Tinto), 9h. (Manila), 12h. (Helwan), 15h. (Azores), 16h. (Azores, Batavia, and Taihoku), 17h. (La Paz), 20h. (San Fernando and La Paz), 22h. (Azores (3)), 23h. (Azores).

Aug. 22d. 8h. 50m. 15s. Epicentre $19^{\circ}0'N$. $70^{\circ}0'W$. (as on 1919 May 20d.).

$$A = +.323, B = -.889, C = +.326.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Vieques	4.4	0 42	-26	—	—	1.1	1.3
Washington	20.8	4 52	+ 1	8 10	-30	—	—
Chicago	27.3	6 2	+ 1	10 59	+13	15.1	—
La Paz	35.6	7 12	- 6	—	—	—	—

Vieques gives also $MN = +1.2m.$

Aug. 22d. 22h. 35m. 55s. Epicentre $41^{\circ}0'N$. $24^{\circ}6'E$. (as on 1919 Jan. 22d.).

$$A = +.686, B = +.314, C = +.656; \quad D = +.416, E = -.909;$$

$$G = +.596, H = +.273, K = -.755.$$

	Δ °	Az.	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Athens	3.2	193	e 0 49	- 1	1 30	+ 2	1.6	1.9
Pompei	7.6	272	i 1 13	-42	2 40	-46	—	3.3
Budapest	7.6	331	1 59	+ 4	—	—	—	—
Pola	8.7	300	e 2 59	+47	—	—	e 4.3	4.4
Rocca di Papa	9.0	279	e 1 26	-50	3 24	-39	—	3.7
Vienna	9.3	324	e 2 35	+15	5 10	+60	i 5.6	6.3
Florence	10.2	290	—	—	—	—	—	4.1
Helwan	12.4	152	8 5	?	—	—	—	—
Zurich	13.1	305	e 3 1	-13	—	—	—	—
Strasbourg	14.1	308	e 3 5	-22	e 7 36	+86	i 8.9	—
Marseilles	14.4	286	2 47	-45	—	—	—	—
Hamburg	16.0	327	e 4 17	+25	—	—	e 8.7	9.8
Barcelona	16.8	279	—	—	—	—	e 5.7	9.3
Uccle	17.1	312	—	—	e 6 59	-21	e 8.9	9.5
De Bilt	17.3	316	—	—	7 15	-10	9.0	11.3
Paris	17.3	304	—	—	e 9 5	?L	(9.1)	10.1
Kew	20.0	310	—	—	—	—	—	13.1
Oxford	20.7	310	8 7	?S	(8 7)	-31	11.2	13.7
Eskdalemuir	23.2	318	—	—	e 9 2	-27	12.1	—
Edinburgh	23.4	319	6 27	+66	9 17	-16	12.1	15.3
Coimbra	24.9	279	8 51	?S	(8 51)	-70	12.1	—

Additional records: Athens iP = +0m.55s., $T_0 = 22h.35m.52s.$ Helwan
 PN = +6m.5s. = S?. Florence M = +4.6m. Hamburg MN = +12.2m.,
 MZ = +11.9m. De Bilt LN = +8.2m., MN = +10.9m. Coimbra
 eLN = +11.2m.

Aug. 22d. Records also at 0h. (Azores (2) and Tokyo), 1h. (Azores), 2h. (San Fernando), 3h. (Denver), 3h. (near Azores), 7h. (near Azores), 11h. (Florence and Rocca di Papa), 12h. (close to Azores), 20h. (Azores), 21h. (San Fernando and La Paz), 23h. (San Fernando).

Aug. 23d. 5h. 22m. 30s. Epicentre $24^{\circ}0'N$. $121^{\circ}0'E$. (as on 1919 Aug. 7d.).
 (See below). Taihoku records $P = +0m.30s.$ Zi-ka-wei e(?S) = +2m.46s.
 A record by Taihoku at 5h.30m.0s. is possibly a repetition.

Aug. 23d. 7h. 52m. 30s. Epicentre $24^{\circ}0'N$. $121^{\circ}0'E$. (as above).

	Δ	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Taihoku	1.1	0 21	+ 4	—	—	0.7	0.7
Hokoto	1.5	0 42	?S	(0 42)	0	—	—
Zi-ka-wei	7.2	—	—	e 2 56	-19	—	—

Aug. 23d. 8h. 22m. 30s. Possible repetition of above. Taihoku records $P = +0m.23s.$, $L = +0m.39s.$

Aug. 23d. Records also at 5h. (Taihoku, as above), 10h. and 11h. (Azores), 13h. (Zi-ka-wei), 16h. (Honolulu), 17h. (Lick and Azores), 18h. (San Fernando), 23h. (Apia and Zi-ka-wei).

Aug. 24d. 1h. 45m. 55s. Epicentre $41^{\circ}7'N.$ $8^{\circ}5'E.$ (as on 1918 May 6d. 8h.).

$$A = +.738, B = +.110, C = +.665.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	M. m.
Rocca di Papa	3.1	e 0 46	- 3	1 25	- 1	1.6
Pompeii	4.6	1 15	+ 4	—	—	—

Aug. 24d. 5h. 13m. 40s. Epicentre $43^{\circ}0'N.$ $125^{\circ}0'W.$ (as on 1919 July 18d.).

$$A = -.420, B = -.599, C = +.682; \quad D = -.819, E = +.574;$$

$$G = -.391, H = -.559, K = -.731.$$

(But whole solution very uncertain owing to slenderness of material).

	Δ	Az.	S. m. s.	O-C. s.	L. m.	M. m.
Victoria	5.5	12	—	—	—	2.8
Berkeley	5.5	157	—	—	e 4.3	—
Chicago	27.4	80	e 11 4	+ 16	—	—
Toronto	32.8	72	—	—	i 15.6	15.9
Ottawa	34.9	69	—	—	e 17.3	—
Honolulu	34.9	243	—	—	14.6	20.3
Ithaca	35.1	74	—	—	48.3	—
Georgetown	36.0	80	e 17 46	?L	26.5	—
Washington	36.0	80	e 11 20	-110	—	—
Edinburgh	69.6	31	—	—	40.3	—
De Bilt	75.6	29	e 21 32	- 1	e 32.3	43.0

Toronto gives $L = +1.5m.$ (which probably refers to another shock), also $e = +22m.8s.$ and $+46m.56s.$ Ottawa gives $+45.3m.$ De Bilt $MN = +44.6m.$

Aug. 24d. 18h. 16m. 18s. Epicentre $36^{\circ}0'N.$ $28^{\circ}0'E.$ (as on 1919 July 20d.).

$$A = +.714, B = +.380, C = +.588; \quad D = +.470, E = -.883;$$

$$G = +.519, H = +.276, K = -.809.$$

	Δ °	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	3.9	302	e 1 12	+11	2 12	+25	2.4	2.5
Helwan	6.7	154	6 42	?M	—	—	—	(6.7)
Rocca di Papa	13.2	301	e 3 18	+ 2	e 6 24	+35	e 8.3	9.7
Strasbourg	19.4	317	4 36	+ 2	—	—	—	15.7
Hamburg	21.6	330	—	—	e 8 42	-15	—	14.7
Uccle	22.5	318	e 5 10	- 1	e 9 6	- 9	—	15.7
De Bilt	22.8	322	—	—	e 9 30	+ 9	—	16.4
Edinburgh	29.0	323	—	—	—	—	—	16.7

Athens gives the T_0 adopted, but notes "P uncertain." Also $MN = +2.5m.$ Helwan $PN = +8m.42s.$ Rocca di Papa gives $ePN = 4m.0s.$ and another P at $+3m.24s.$ De Bilt $eN = +10m.42s.$, $MN = +14.4m.$

Aug. 24d. Records also at 0h. (Apia), 1h. (San Fernando), 5h. (Mizusawa), 8h. (Azores), 10h. (La Paz), 11h. (La Paz and Sydney), 12h. (Victoria, Edinburgh, Berkeley, Toronto, Chicago, and Helwan; possibly repetition from $43^{\circ}0'N.$ $125^{\circ}0'W.$, as at 5h.; if so at $T_0 = 12h.41m. \pm$ It is curious that Toronto again gives a double record, $L = 12h.45m.54s.$ and $L = 12h.58m.54s.$, of which the second is appropriate to the above supposition), 13h. (Edinburgh, possibly due to the shock just mentioned), 14h. (Helwan), 16h. (Azores), 19h. (Melbourne, Sydney, Riverview, and Chicago), 20h. (Taihoku and close to Osaka), 21h. (San Fernando and Helwan).

Aug. 25d. 3h. 33m. 0s. Close to Granada, which records $iP = +16s$. Tortosa gives $P = +1m.32s.$, $L = +2.7m.$, $M = +3.6m.$

Aug. 25d. 19h. 55m. 15s. Epicentre $32^{\circ}0'N$, $100^{\circ}0'E$.

$A = -.148$, $B = +.835$, $C = +.530$; $D = +.985$, $E = +.174$;
 $G = -.092$, $H = +.522$, $K = -.848$.

The epicentre $29^{\circ}0'N$, $104^{\circ}0'E$. of 1917 July 30d. was tried and found quite unsuitable.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Calcutta	14.2	230	5 57	?S	(5 57)	-16	8.8	—
Zi-ka-wei	18.3	87	e 4 22	+ 1	e 7 52	+ 5	—	12.0
Simla	19.4	274	e 8 51	?S	(8 51)	+41	—	12.4
Nagasaki	25.1	80	10 14	?S	(10 14)	+ 9	13.9	14.5
Manila	25.9	128	5 45	- 2	—	—	14.8	17.1
Osaka	29.6	75	—	—	11 0	-27	—	19.0
Kodaikanal	30.2	230	21 45	?	—	—	—	—
Colombo	31.0	221	14 45	?L	—	—	—	23.3
Tokyo	33.0	72	—	—	—	—	e 16.2	—
Batavia	38.7	169	7 36	- 8	13 33	-15	e 20.3	21.4
Lemberg	57.5	312	—	—	e 26 9	?	32.4	34.3
Helwan	58.0	286	—	—	26 45	?	—	—
Budapest	61.3	311	—	—	—	—	e 43.1	—
Vienna	62.8	312	e 12 45	+134	—	—	e 32.7	40.7
Hamburg	64.8	320	—	—	e 19 45	+22	e 34.8	41.6
De Bilt	67.6	319	—	—	20 47	+50	e 34.8	44.2
Florence	67.7	310	e 34 45	?L	—	—	(34.8)	39.5
Strasbourg	68.0	314	—	—	—	—	e 38.3	—
Uccle	69.0	318	e 20 51	?S	(20 51)	+37	e 35.8	44.9
Edinburgh	70.7	324	—	—	—	—	37.8	47.0
Paris	71.0	317	—	—	—	—	e 37.8	—
Eskdalemuir	71.0	324	—	—	—	—	35.8	—
Kew	71.3	320	—	—	—	—	—	44.8
Coimbra	82.2	313	—	—	—	—	e 42.7	—
San Fernando	82.9	310	43 45	?L	—	—	(43.8)	—

Additional records: Zi-ka-wei gives $MN = +10.4m.$, $T_0 = 19h.55m.16s$.
 Manila $MN = +17.9m.$, Osaka $MN = +18.2m.$, Helwan $PN = +27m.45s.$, Hamburg $MN = +36.7m.$, De Bilt $SN = +29m.49s.$, $e = +28m.35s.$, $MN = +39.2m.$, epicentre $30^{\circ}7'N$, $99^{\circ}6'E$. Uccle $S = +29m.3s.$
 $MN = +39.6m.$

Aug. 25d. 21h. 50m. 14s. About $0^{\circ}6'$ from Athens, which records $P = +9s.$, $iLN = +23s.$, $ME = +35s.$, $MN = +32s.$ See two other shocks on Aug. 26d.

Aug. 25d. Records also at 1h. (San Fernando), 4h. (Azores), 7h. and 9h. (Apia), 12h. (Barcelona and Tortosa), 15h. (Lick), 16h. (Pompeii), 20h. (Taihoku and Apia).

Aug. 26d. 0h. 2m. 20s. About $0^{\circ}6'$ from Athens (as on Aug. 25d. 21h.), which records $PN = +9s.$, $L = +23s.$, $ME = +27s.$, $MN = +30s.$ (possibly $39^{\circ}0'N.$, $23^{\circ}0'E.$, as on 1918 Jan. 20d.).

Aug. 26d. 3h. 17m. 57s. About $0^{\circ}6'$ from Athens as above, $eP = +9s.$, $eL = +23s.$, $ME = +27s.$, $MN = +30s.$

Aug. 26d. Records also at 5h. (La Paz and Tortosa), 7h. (Rio Tinto), 9h. (Azores), 12h. (Lick and Berkeley), 14h. (Berkeley and Lick (2)), 22h. (San Fernando), 23h. (Lick).

Aug. 27d. 1h. 1m. 56s. Epicentre $24^{\circ}0'N$, $121^{\circ}0'E$. (as on 1919 Aug. 23d.).

$A = -.470$, $B = +.783$, $C = +.407$.

	Δ °	P. m. s.	O-C. s.	L. m.	M. m.
Taihoku	1.1	9 14	- 3	0.3	0.4
Zi-ka-wei	7.2	e 1 56	+ 7	—	—

Aug. 27d. 5h. 21m. 18s. Epicentre $19^{\circ}0'N$. $144^{\circ}0'E$. (as on 1919 May 19d.).

A = -·765, B = +·556, C = +·326; D = +·588, E = +·809;

G = -·263, H = +·191, K = -·946.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	17·1	348	3 46	-20	7 2	-18	9·8	—
Kobe	17·4	336	4 10	0	—	—	—	—
Osaka	17·4	336	4 10	0	—	—	7·7	13·4
Mizusawa	20·3	354	4 24	-21	7 51	-38	—	—
Taihoku	21·6	290	—	—	e 9 24	+27	11·2	—
Manila	22·5	262	e 5 36	+25	—	—	12·5	—
Zi-ka-wei	23·7	305	e 5 24	-1	e 42 38	?	—	—
Ootomari	27·7	358	5 54	-11	—	—	—	—
Batavia	44·4	238	e 8 33	+ 4	—	—	—	12·1
Riverview	53·3	173	—	—	—	e 23·3	25·7	—
Honolulu	54·2	78	e 8 24	-70	16 12	-59	26·7	33·9
Adelaide	54·2	184	16 54	?S	(16 54)	-17	29·0	31·8
Melbourne	56·8	179	18 18	?S	(18 18)	+34	31·5	37·7
Colombo	63·4	268	19 42	?S	(19 42)	+36	—	41·7
Kodaikanal	64·8	272	37 24	?L	—	—	(37·4)	—
Victoria	77·6	42	21 1	?S	(21 1)	-55	—	47·1
Berkeley	81·3	52	—	—	—	e 32·7	—	—
Lemberg	93·2	325	—	—	—	e 57·5	62·3	—
Hamburg	97·4	334	e 17 36	?PR ₁	—	e 47·7	56·7	—
Vienna	98·1	328	17 36	?PR ₁	—	e 53·7	65·2	—
Helwan	98·9	306	24 42	?S	(24 42)	-63	—	—
Edinburgh	100·1	340	—	—	32 12	?SR ₁	47·7	—
De Bilt	100·4	334	—	—	e 24 36	-84	e 49·7	51·6
Esdalemuir	100·6	340	—	—	—	—	48·7	—
Uccle	101·7	334	—	—	—	e 50·7	65·7	—
Strasbourg	102·0	330	—	—	—	e 50·2	63·7	—
Chicago	102·8	37	24 27	?S	(24 27)	-115	40·4	—
Kew	102·9	339	—	—	—	—	—	68·7
Florence	103·7	325	49 42	?	—	—	53·7	56·7
Rocca di Papa	104·4	324	e 15 31	+59	—	e 54·0	76·8	—
Ann Arbor	104·5	34	—	—	23 42	-176	—	—
Toronto	105·9	30	—	—	—	—	57·9	73·2
Ottawa	106·1	27	e 18 26	[+18]	e 27 36	+43	50·9	—
Barcelona	110·0	330	—	—	—	e 57·2	74·4	—
Georgetown	110·5	32	e 17 42	[-42]	—	—	64·1	—
Coimbra	115·4	337	35 42	?	—	—	51·7	—
La Paz	149·3	90	19 43	[-12]	33 52	+118	71·7	81·1

Additional records: Osaka MN = +13·6m. Mizusawa PN = +4m.23s., SN = -7m.55s., T₀ = 5h.21m.23s. Riverview e = +5m.7s., MN = -38·1m. Adelaide PR₁ = +18m.54s., S = +23m.30s., SR₁ = +25m.36s. Melbourne PR₁ = +20m.0s. (=SR₁?), SR₁ = +28m.30s.(??). Perth (Δ = 57°·7) gives simply 5h.49m. to 7h.9m. Victoria gives S = +25m.27s. (=SR₁?). Hamburg MNZ = -65·7m. Helwan PN = -30m.42s. De Bilt MN = +55·6m., epicentre $21^{\circ}0'N$. $145^{\circ}1'E$. Chicago S = +31m.54s. = SR₁?, L = +50·7m. and +63·7m. Toronto alternatives for L +24·5m. (=S?), +38·5m. (=SR₂?), and +62·0m. Ottawa iPN = +18m.27s., i = +24m.52s., eN = +27m.42s., eL = +65·8m. and +78·2m. Coimbra ePN = +34m.24s., LN = +61·7m., LE = +63·7m.

Aug. 27d. Records also at 1h. (San Fernando), 4h. (Helwan), 6h. (Azores), 7h. (Manila), 11h. (Denver), 16h. (Helwan), 17h. (Apia), 18h. (Azores), 20h. (San Fernando), 22h. (La Paz).

Aug. 28d. 19h. 34m. 22s. Epicentre $24^{\circ}0'N$. $121^{\circ}0'E$. (as on 27d.).

A = -·470, B = +·783, C = +·407; D = +·857, E = +·515;

G = -·210, H = +·349, K = -·914.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1·1	24	0 35	+18	—	—	0·8	1·1
Hokoto	1·4	252	0 8	-13	—	—	0·5	0·5
Zi-ka-wei	7·2	3	e 1 49	0	e 3 27	+12	—	4·5
Colombo	42·9	255	29 8	?	—	—	—	30·3
Kodaikanal	43·6	260	28 26	?	—	—	—	—
Honolulu	73·6	74	—	—	—	e 41·6	52·6	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Vienna	z.	81.3	320	12 23	- 4	—	—	—	—
Hamburg		82.3	326	—	—	—	—	c 42.6	—
De Bilt		85.6	326	—	—	e 23 41	+15	c 42.6	46.5
Strasbourg		86.2	321	—	—	—	—	—	57.6
Uccle		86.7	326	—	—	—	—	—	46.6
Edinburgh		87.2	332	—	—	—	—	44.6	56.6
Eskdalemuir		87.5	332	—	—	—	—	42.6	—
Kew		88.6	328	—	—	—	—	—	57.6

Additional records: Hokoto M = +1.0m. Zi-ka-wei MN = +5.0m., T_0 = 19h.34m.12s. De Bilt eLN = +43.8m., MN = +45.8m. Colombo and Kodaikanal probably record a local shock, as indicated by the short interval from P to M at Colombo. Strasbourg gives another vague record at +61.8m.

Aug. 28d. Records also at 2h. (San Fernando and Helwan), 14h. (La Paz and Helwan), 20h. (Helwan and San Fernando), 23h. (close to Osaka and Kobe).

1919. Aug. 29d. 5h. 43m. 45s. Epicentre $3^{\circ}5S$. $128^{\circ}5E$.

A = -·621, B = +·781, C = -·061; D = +·783, E = +·622;
G = +·038, H = -·048, K = -·998.

This earthquake was originally assigned to the epicentre $2^{\circ}0S$. $133^{\circ}0E$., as on 1918 Jan. 21d.: but the residuals showed the solution to be defective and on discussion in the usual way indicated the above position, which was then seen to fall with some precision on the line through four other epicentres, as below. The column C for the latitude is from the formula $35^{\circ}0 - 0.3 \times \text{long.}$

			Long E.	Lat.	C.	O-C.
			°	°	°	°
1917 Nov.	14d.	119.7	-0.7	-0.9	+0.2	
1917 June	3d.	122.0	-2.0	-1.6	-0.4	
1919 Aug.	29d.	128.5	-3.5	-3.6	+0.1	
1917 Aug.	30d.	136.0	-6.0	-5.8	-0.2	
1917 July	27d.	140.0	-7.0	-7.0	0.0	

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Manila		19.5	338	4 27	- 8	(8 15)	+ 2	8.3	11.7
Batavia		21.7	262	e 4 58	- 3	9 1	+ 2	—	9.6
Taihoku		29.3	347	6 12	- 9	(11 36)	+14	11.6	18.7
Perth		31.0	201	6 41	+ 3	10 57	-54	17.6	—
Adelaide		32.8	165	6 45	-10	11 57	-24	15.2	20.2
Zi-ka-wei		35.4	350	e 7 3	-14	e 12 27	-34	e 15.2	17.8
Riverview		37.0	146	e 7 34	+ 4	i 13 18	- 6	i 15.8	26.4
Sydney		37.0	146	7 33	+ 3	13 27	+ 3	20.3	27.0
Melbourne		37.5	160	8 3	+29	(13 15)	-16	20.3	32.0
Kobe		38.6	10	7 46	+ 3	—	—	19.8	20.3
Osaka		38.8	10	7 36	- 8	13 38	-11	18.6	22.2
Tokyo		40.6	15	7 45	-15	16 7	+112	20.4	22.2
Mizusawa	E.	44.2	15	8 20	- 7	14 53	-12	—	—
Calcutta		47.0	307	8 39	- 8	(15 21)	-20	15.3	—
Colombo		49.6	282	8 45	-19	16 45	+31	20.7	36.6
Ootomari		51.7	12	9 25	+ 7	(16 45)	+ 5	16.8	—
Kodaikanal		52.6	286	11 45	?PR ₁	—	—	27.6	34.8
Bombay		59.4	296	10 11	+ 5	—	—	—	33.6
Simla		59.8	310	10 39	+28	18 33	+12	25.2	40.4
Apia		59.8	103	e 10 33	+22	(18 50)	+29	18.8	36.3
Mauritius		70.8	250	6 15	?	(20 45)	+ 9	20.8	35.5
Honolulu		76.0	67	e 16 15	?	21 45	+ 8	43.3	47.4
Helwan		98.0	300	14 51	+51	—	—	—	—
Lemberg		101.9	320	e 19 45	?PR ₁	e 27 15	+61	e 54.9	77.3
Athens		103.8	309	e 17 33	[-27]	e 27 51	+80	53.3	56.3
Capetown		104.4	232	24 45	?S	(24 45)	-112	—	56.3
Victoria		104.6	40	18 18	?PR ₁	24 42	-116	28.3	28.6
Budapest		105.6	319	e 17 57	[-10]	—	—	—	—
Vienna		107.2	320	e 18 45	?PR ₁	28 9	+66	e 62.3	80.8
Berkeley		107.2	50	e 18 36	?PR ₁	—	—	—	—
Lick		107.9	50	—	—	—	—	e 45.3	—
Hamburg		109.4	326	e 19 15	?PR ₁	—	—	e 52.3	63.4

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Rocca di Papa	111.4	313	e 18 51	?PR ₁	—	—	e 58.8	79.0
Florence	111.8	316	19 25	?PR ₁	—	—	—	33.3
De Bilt	112.6	326	—	—	e 25 33	-138	e 57.3	69.7
Strasbourg	112.6	320	e 18 45	[+15]	e 30 22	?SR ₁	—	69.1
Uccle	113.6	325	e 19 39	?PR ₁	25 39	-140	—	70.6
Edinburgh	114.9	331	19 51	?PR ₁	—	—	—	75.1
Eskdalemuir	115.3	331	19 51	?PR ₁	29 33	+81	45.8	62.4
Paris	115.6	323	e 25 43	?S	(25 43)	-152	59.3	68.3
Kew	115.9	327	25 15	?S	(25 15)	-182	—	73.3
Oxford	116.3	327	—	—	—	—	—	129.2
Bidston	116.4	330	24 33	?S	33 51	?SR ₁	—	81.8
Tucson	117.5	53	—	—	—	—	55.1	64.6
Barcelona	118.9	315	e 19 27	?PR ₁	?36 27	?SR ₁	61.3	74.1
Tortosa	120.3	315	20 23	?PR ₁	36 50	?SR ₁	58.3	75.2
Granada	124.8	313	e 20 56	?PR ₁	—	—	—	—
Coimbra	126.6	320	22 20	?PR ₁	32 40	+183	47.0	78.1
San Fernando	126.9	313	21 18	?PR ₁	—	—	72.8	97.3
Chicago	130.0	34	21 32	?PR ₁	28 25	-96	35.4	—
Toronto	132.9	26	23 3	?PR ₁	(32 33)	+133	67.0	85.8
Ottawa	133.0	21	i 23 2	?PR ₁	e 32 7	+106	68.2	—
Ithaca	135.1	26	e 22 19	?PR ₁	—	—	71.1	—
Washington	137.7	30	e 22 37	?PR ₁	29 27	-83	e 72.3	—
Georgetown	137.7	30	e 22 32	?PR ₁	—	—	e 72.3	—
Cheltenham	137.9	30	22 46	?PR ₁	—	—	72.6	82.7
La Paz	154.1	141	i 20 19	[-18]	i 34 27	?	75.6	81.6

Additional records: Manila MN = +10.4m. Adelaide PR₁ = +8m.27s.,
 SR₁ = +13m.27s. Zi-ka-wei MN = +19.0m., T₀ = 5h.44m.0s. River-
 view PR₁ = +9m.5s., PR₂ = +9m.17s., PS = +13m.39s., SR₁ = +15m.35s.,
 SR₂ = +16m.8s., MN = +24.4m., T₀ = 5h.43m.59s. Sydney PR₁ =
 +9m.15s. Melbourne SR₁ = +13m.15s., SR₂ = +15m.27s. Kobe
 MN = +20.7m. Osaka MN = +20.2m., T₀ = 5h.43m.44s., Δ = 5040km.
 Mizusawa SN = +14m.51s., T₀ = 5h.43m.51s. Mauritius L = +20m.51s.,
 MN = +31.6m. Helwan PN = +17m.39s. = PR₁?. Lemberg i =
 +24m.39s. Athens iPR₁ = +24m.49s. Capetown M = +67.8m.
 Victoria L = +35.2m. Budapest recorded at 5h.1m.42s.: altered to 6h.
 Hamburg MN = +63.2m., MZ = +70.3m. De Bilt PR₁ = +19m.36s.,
 e = +22m.6s., eLN = +58.3m., MN = +64.7m. Strasbourg e = +19m.15s.
 iPR₁ = +30m.20s., e = +35m.25s., e = +39m.23s., e = +46m.19s., MN =
 +75.4m. Uccle i = +35m.28s., i = +39m.34s., i = +46m.39s., MN =
 +64.5m. Edinburgh M = +84.6m. Eskdalemuir T₀ = 5h.51m.52s.
 Barcelona PR₁(?) = +26m.34s. Coimbra PN = +20m.52s., SN = +33m.8s.,
 SR₁N = +38m.7s., SR₁N = +42m.48s., MN = 81.2m. San Fernando
 MN = +92.3m. Chicago L = +39.0m. and +62.3m. Toronto E? =
 +14m.57s., L = +32.6m., L = +51.2m., eL = +73.3m., i = +70m.51s.,
 i = +71m.39s. Ottawa eN = +28m.48s., eN = +40m.5s., L = +81.3m.,
 +91.3m. Ithaca eN = +43m.30s., eE = +49m.13s., eN = +54m.5s.,
 LN = -67.4m. Washington eL = +37.3m. Georgetown PN =
 22m.43s., ePZ = +22m.43s., eL = +42.3m., L = +42.5m. Cheltenham
 PN = +22m.53s., LN = +71.6m. La Paz Δ = 18000km.

Aug. 29d. 6h. 41m. 30s. At 36°2N. 21°4E. (as on 1918 Jan. 27d.?).

A = +.751, B = +.294, C = +.591.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	2.5	e 0 43	-4	e 1 19	-10	e 1.4	1.6
Rocca di Papa E.	8.7	2 18	+6	—	—	—	—
N.	8.7	1 54	-18	—	—	—	—

Aug. 29d. 13h. 46m. 45s. Epicentre 15°08. 165°0E.

A = -.933, B = +.250, C = -.259; D = -.259, E = +.966;
 G = +.250, H = -.067, K = -.966.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Sydney	22.6	211	6 33	-81	(9 27)	+10	9.5	12.3
Riverview	22.6	211	e 5 5	-7	i 9 12	-5	—	10.4
Melbourne	28.9	214	6 45	-28	10 45	-30	12.4	14.3
Adelaide	31.0	225	6 45	-53	11 21	-31	15.8	17.3
Honolulu	51.3	46	e 15 21	?S	(e 15 21)	-74	27.3	32.3

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	52.6	303	e 9 41	+17	—	—	—	—
Batavia	57.7	274	e 10 1	+ 4	17 56	+ 1	—	—
Zi-ka-wei	62.3	320	10 14	-13	—	—	—	—
Colombo	87.1	278	23 45	?S	(23 45)	+ 3	—	25.3
Victoria	89.6	40	47 48	?L	—	—	(47.8)	53.7
Toronto	119.0	48	—	—	47 48	?	49.4	—
Helwan	135.0	297	23 15	?PR ₁	(29 15)	-78	—	—
Vienna	137.9	330	19 14	[-22]	—	—	—	24.6
Rocca di Papa	144.1	323	19 22	[-25]	—	—	—	19.6
Tortosa	150.9	336	19 41	[-16]	—	—	20.9	21.0

Additional records: Adelaide PR₁ = +7m.21s., SR₁ = +13m.27s. River-view PR₁ = +5m.39s., PR₂ = +6m.4s., PS = +9m.22s., SR₁ = +10m.1s., T₀ = 13h.46m.25s. Honolulu gives eS as eP and records eS = +21m.15s.

Aug. 29d. Records also at 0h. (Osaka), 5h. (La Paz), 6h. (Victoria and Athens), 8h. (Kodaikanal and Tokyo), 23h. (Tucson).

Aug. 30d. 6h. 4m. 0s. Epicentre 19°3N. 62°5W. (as on 1918 June 11d.).

$$A = +.436, B = -.837, C = +.330; \quad D = -.887, E = -.462; \\ G = +.153, H = -.293, K = -.944.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Vieques	3.0	249	0 49	+ 2	(1 12)	-11	1.2	1.6
Washington	23.3	330	5 36	+16	9 20	-11	—	—
Chicago	31.0	321	5 36	-62	11 17	-34	16.3	—
La Paz	36.2	189	—	—	e 13 0	-13	22.3	23.8
De Bilt	61.2	40	—	—	—	—	e 30.0	35.4

Additional records: Vieques PN = +48s. It is above assumed that L should be S. De Bilt gives eLN = +34.0m., MN = +37.5m.

Aug. 30d. Records also at 0h. (San Fernando), 2h. (Hamburg), 3h. (San Fernando), 11h. (Helwan (2)), 13h. (Ithaca), 15h. (Azores), 17h. (Manila), 19h. (La Paz), 20h. (Taihoku, Rio Tinto, and San Fernando), 22h. (Taihoku).

Aug. 31d. 0h. 24m. 40s. Epicentre 59°2N. 151°0W. (as on 1918 April 15d. 8h.).

$$A = -.448, B = -.248, C = +.859.$$

(Very uncertain; it is difficult to interpret the Chicago record.)

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Victoria	19.4	4 32	- 2	—	—	9.9	12.9
Chicago	42.0	—	—	e 26 40	?M	—	—
Toronto	44.8	—	—	(14 44)	-28	14.7	—

Aug. 31d. 2h. 32m. 48s. Epicentre 34°5N. 41°8E. (as on 1918 April 25d.).

$$A = -.614, B = +.549, C = +.566; \quad D = +.667, E = -.746; \\ G = +.422, H = +.378, K = -.824.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Lemberg	20.1	325	e 7 30	?S	(7 30)	-55	e 10.8	12.1
Vienna	23.3	314	i 5 16	- 4	—	—	e 9.8	15.2
Rocca di Papa	23.9	297	5 24	- 3	9 42	0	18.4	—
Strasbourg	28.8	310	e 17 12	?M	—	—	—	—
De Bilt	31.4	315	—	—	e 12 0	+ 2	—	20.3
Uccle	31.5	313	—	—	—	—	e 16.2	18.2

Additional records: Lemberg gives c = +9m.12s. Rocca di Papa PN = +5m.54s., eS = +10m.18s. De Bilt MN = +18.5m.

1919. Aug. 31d. 17h. 20m. 34s. Epicentre $15^{\circ}0S. 165^{\circ}0E.$
(as on 1919 Aug. 29d.).

A = -·933, B = +·250, C = -·259; D = +·259, E = +·966;
G = +·250, H = -·067, K = -·966.

(But see Note at end as regards deep focus and for revised epicentre
to $15^{\circ}7S. 167^{\circ}3E.$)

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Apia	22·5	90	i 4 34	-37	i 9 1	-14	—	9·4
Sydney	22·6	211	5 2	-10	9 8	-9	12·0	13·2
Riverview	22·6	211	i 5 10	-2	i 9 16	-1	10·1	13·1
Melbourne	28·9	214	6 44	+27	11 44	-29	14·4	15·4
Adelaide	31·0	225	6 26	-12	11 32	-19	15·3	18·5
Honolulu	51·3	46	i 8 50	-25	—	—	e 19·4	22·4
Manila	52·6	303	e 9 30	+6	(17 0)	+9	(17·0)	17·6
Tokyo	56·0	338	9 29	-17	12 8	?PR ₁	19·4	—
Osaka	57·1	331	10 0	+7	17 52	-5	24·9	30·4
Batavia	57·7	274	e 10 8	-11	19 55	+120	e 30·4	—
Taihoku	58·3	314	10 17	-16	(18 18)	+15	18·3	20·2
Mizusawa	58·5	340	10 1	-1	—	—	24·9	—
	58·5	340	10 2	0	—	—	24·8	—
Zi-ka-wei	62·3	320	e 10 34	+7	e 18 56	-4	—	34·4
Ootomari	64·8	346	11 48	+64	(20 25)	+62	20·4	—
Calcutta	83·9	295	12 14	-27	(22 56)	-12	22·9	24·2
Berkeley	86·1	49	e 12 36	-18	e 23 45	+14	—	35·4
Lick	86·4	50	e 7 26	?	—	—	—	—
Colombo	87·1	278	12 2	-58	(21 50)	-112	21·8	23·7
Victoria	89·6	40	(13 8)	-6	(22 58)	-72	23·0	52·0
Kodaikanal	90·4	280	17 38	?PR ₁	(23 32)	-46	23·5	27·3
Tucson	93·1	55	13 27	-6	24 27	-19	46·8	54·8
Simla	95·9	301	e 18 8	?PR ₁	23 50	-85	31·5	32·1
Bombay	96·8	288	14 10	+17	—	—	—	—
Mauritius	100·2	246	—	—	24 24	-94	24·4	31·9
Cipolletti	106·8	139	19 26	?PR ₁	(30 14)	+195	30·2	36·8
Chicago	112·8	50	18 38	[+8]	28 31	+39	55·8	—
Pilar	113·9	134	—	—	(29 14)	+73	29·2	30·2
Ann Arbor	115·7	50	18 14	[-26]	30 56	+160	51·4	71·4
Toronto	119·0	47	—	—	i 31 2	+140	e 59·8	68·6
La Paz	118·8	120	e 18 43	[-6]	i 29 44	-64	49·4	55·8
Ithaca	121·0	48	e 20 38	?PR ₁	e 30 13	+76	e 46·7	—
Washington	121·0	51	19 26?	?PR ₁	—	—	—	—
Georgetown	121·0	51	e 18 48	[-7]	30 26	+89	e 44·8	—
Cheltenham	121·1	51	20 19	?PR ₁	29 59	+61	67·1	71·0
Ottawa	121·1	44	i 20 2	?PR ₁	e 29 49	+51	e 49·9	—
Capetown	121·6	213	22 8	?PR ₁	36 56	?SR ₁	77·6	85·6
Lemberg	133·0	324	e 19 18	[-7]	e 22 20	?PR ₁	e 64·3	66·5
Helwan	135·0	297	18 56	[-34]	—	—	—	45·4
Dyce	136·6	349	i 19 46	[+13]	—	—	—	—
Hamburg	136·7	339	i 19 24	[-9]	—	—	e 65·4	76·3
Vienna	137·9	330	e 19 16	[-20]	22 49	?PR ₁	e 24·9	65·8
Edinburgh	138·1	349	19 32	[-4]	—	—	—	41·4
Eskdalemuir	138·7	349	19 14	[-23]	28 12	-162	41·9	—
Athens	138·9	310	e 19 26	[-12]	—	—	101·5	107·7
De Bilt	139·6	340	19 23	[-16]	—	—	e 57·9	68·7
Bidston	140·5	347	19 38	[-2]	—	—	—	81·4
Uccle	140·9	340	e 19 21	[-20]	—	—	e 45·4	88·4
Pola	141·5	326	e 19 28	[-14]	—	—	e 23·2	23·9
Oxford	141·6	346	19 27	[-15]	e 25 58	?	—	—
Strasbourg	141·6	333	19 24	[-18]	—	—	67·4	91·0
Kew	141·7	346	31 26	?S	(31 26)	-13	—	70·9
Zurich	142·2	331	e 19 30	[-13]	—	—	—	—
Paris	143·2	340	i 19 33	[-12]	—	—	68·4	—
Milan	143·4	331	19 39	[-7]	20 45	?	—	20·8
Besancon	143·4	335	19 32?	[-14]	—	—	—	74·4
Florence	143·5	327	19 41	[-5]	30 16	-68	—	41·4
Pompeii	143·7	320	e 19 30	[-16]	—	—	—	20·9
Rocca di Papa	144·1	323	i 19 37	[-10]	—	—	—	19·8
Marseilles	146·8	331	18 48	[-63]	19 29	[-23]	23·6	—
Barcelona	149·7	332	19 47	[-8]	26 47	?	50·0	77·3
Toriosa	150·9	336	19 48	[-9]	—	—	84·6	100·5
Algiers	152·9	327	19 48	[-12]	—	—	44·4	65·4
Coimbra	154·2	343	19 19	[-42]	24 21	?PR ₁	e 44·7	54·3
Azores	155·4	21	29 38	?S	(29 38)	?	—	—
Rio Tinto	156·1	343	19 26	[-37]	—	—	—	40·4
San Fernando	157·2	342	20 16	[+11]	—	—	108·4	120·4

For Notes see next page.

NOTES TO AUG. 31d. 17h. 20m. 34s.

Additional records: Apia $P = +4m.40s.$, $+5m.14s.$, $+5m.22s.$ Riverview
 $iPR_1 = +5m.42s.$ and $+6m.1s.$, $PS = +9m.31s.$, $T_0 = 17h.20m.24s.$, $16^\circ 08'$
 $166^\circ 0'E.$ Melbourne $SR_1 = +12m.50s.$ Adelaide $SR_1 = +13m.38s.$
 Manila $S = +14m.5s.$, $MN = +17^\circ 7m.$, $T_0 = 17h.20m.40s.$ Osaka $MN =$
 $+33.9m.$, $T_0 = 17h.20m.46s.$, $\Delta 6550km.$ Zi-ka-wei $MN = +32.1m.$,
 $T_0 = 17h.20m.48s.$ Ootomari, L is probably S; time one minute wrong?
 Calcutta $LN = +23.1m.$, $MN = +24.3m.$ Colombo $S = +15m.44s.$
 Victoria records $P = +7m.14s.$ (which must refer to some earlier shock—see
 Lick), and then P as S , and S as L . Berkeley $ePN = +12m.34s.$, $ePV =$
 $+12m.32s.$, $eSV = +23m.43s.$, $T_0 = 17h.22m.53s.$ Lick records the earlier
 shock (see Victoria). Chicago $PR = +25m.29s.$, probably $SL = +59.4m.$
 and $+79.4m.$ Ann Arbor $PE = +17m.56s.$, $SE = +30m.26s.$, $LN =$
 $+41.4m.$, $MN = +69.4m.$ Toronto $eL = +60.9m.$, $eL = +65.1m.$ La
 Paz $i = +19m.56s.$, $PR_1? i = +30m.38s.$, $T_0 = 17h.26m.12s.$ Ithaca
 $eE = +27m.19s.$, $eN = +36m.36s.$, $eE = +37m.44s.$, $eLN = +51.6m.$
 Georgetown $PN = +19m.48s.$, $PR_1? i = +30m.38s.$ Cheltenham $PN = +20m.51s.$,
 $PR_1? i = +30m.38s.$ Ottawa $ePN = +18m.46s.$,
 $[-9s.]$, $e = +26m.34s.$ and $+27m.56s.$ Helvan $PN = +24m.8s.$, $MN =$
 $+43.3m.$ Dyce $i = +20m.2s.$ Hamburg $i = +22m.59s.$, $PR_1,$
 $MZ = +74.4m.$ Vienna $i = +19m.26s.$, $eL = +51.4m.$, $M = +87.4m.$ La
 Edinburgh record at $+72m.16s.$ Eskdalemuir $PR = +22m.22s.$
 Athens $iPRE = +23m.6s.$, $eLN = +100.7m.$, $MN = +102.7m.$ De Bilt
 $iPR = +23m.9s.$, $eLN = +67.4m.$, $MN = +68.5m.$, $T_0 = 17h.19m.23s.$, $14^\circ 9'S.$
 $164^\circ 2'E.$ Uccle $iPR_1 = +23m.8s.$ Strasbourg $iPR_1 = +23m.17s.$
 Kew $M = +100.4m.$ Paris $PR_1 = +23m.21s.$, $PR_2 = +24m.11s.$ Rocca
 di Papa $MN = +20.7m.$ Coimbra $ePN = +19m.47s.$, $[-14s.]$, $PR_1N =$
 $+22m.35s.$, $PR_2N = +23m.15s.$ San Fernando $MN = +124.4m.$

NOTE TO 1919 AUGUST 31d. 17h. 20m. 34s.

The antipodal stations give fairly consistent residuals in [P]. If we take the
 N inst. record for Coimbra from the Notes, i.e. $[-14s.]$, instead of $[-42s.]$
 given by the E inst. in the Table, and exclude Rio Tinto (only given to
 whole minutes), they are

S.	S.	S.	S.	S.	S.	S.	S.	S.	S.
+13	-4	-7	-9	-10	-12	-14	-15	-20	-26
+11	-5	-7	-9	-12	-13	-14	-17	-20	-34
-2	-5	-7	-9	-12	-14	-15	-18	-23	-62

of which the mean is $-13s.$, the mean numerical difference from this being
 $\pm 8s.$ The probable error of the mean is thus about $\pm 1s.$, and the focal
 depth indicated is about $+0.14$ of the earth's radius. Of course, the de-
 termination of T_0 is uncertain: the stations within 90° of the epicentre give
 the following corrections to T_0 determined from the S and P residuals:

	S.		S.		S.
Ootomari	+65	Zi-ka-wei	+11	Sydney	-10
Melbourne	+26	Osaka	+10	Calcutta	-46
Taohoku	+17	Manila	+2	Berkeley	-58
Colombo	+12	Adelaide	-3	Apia	-66

The question is whether we can reasonably increase all the residuals by $+10s.$,
 which means correcting T_0 by $-10s.$, and it will be seen that it is difficult to
 justify this. The more consistent corrections to T_0 (from $+27s.$ to $-11s.$)
 have a mean value $+8s.$ We proceed then to assume a focal depth -0.15
 radius and to discuss a correction to the adopted epicentre. Grouped in
 azimuth we find the following corrections to Δ on the above supposition:—

Station.	Az.	$\delta \Delta$	Station.	Az.	$\delta \Delta$	Station.	Az.	$\delta \Delta$	Station.	Az.	$\delta \Delta$
Victoria	40	$+1.0$	Sydney	210	$+0.1$	Calcutta	298	$+0.9$	Osaka	332	$+2.4$
Honolulu	48	-2.4	Melbourne	212	$+2.1$	Manila	304	$+2.4$	Mizusawa	340	$+1.5$
Berkeley	50	$+1.1$	Adelaide	225	-0.2	Taohoku	315	$+3.1$	Ootomari	346	$+1.3$
Apia	90	$+1.2$				Zi-ka-wei	320	$+2.0$			

We see that the corrections indicated by Victoria and Berkeley are opposite
 in sign to the other two in the same group. In itself this would not justify
 us in excluding them; but there is some evidence that they may not be true
 records. Victoria and Lick record an earlier shock, and though the S and L
 records for Victoria have been assigned to the P and S of this shock, the
 identification is doubtful. The Berkeley records may also be affected.
 Excluding them also we get five equations as below, separating Honolulu
 and Apia:—

Az.	No. of Stations.	$\delta \Delta$		Calc.	O - C.
48	1	$-2.4 = +$	$.74x + .67y$	-1.2	-1.2
90	1	$-1.2 = +$	$1.00x + .00y$	-2.2	$+1.0$
216	3	$-0.7 = -$	$.59x - .81y$	$+0.8$	-0.1
309	4	$+1.9 = -$	$.78x - .63y$	$+2.2$	-0.3
339	3	$-1.7 = -$	$.36x + .93y$	$+1.4$	$+0.3$

The values of $\delta\Delta$ are equated to terms of the form $xX\sin Az. + yY\cos Az.$, and the values of x and y are found to be $x = -2\cdot25$ $y = +0\cdot68$, with which the column "Calc." has been formed. The column O-C shows that the major part of the discrepancies are removed by these assumptions. Hence we may give a revised solution for the epicentral stations in the following form:—

Aug. 31d. 17h. 20m. 34s. Epicentre $15^{\circ}78$. $167^{\circ}3E$.

$A = -.940$, $B = +.212$, $C = -.271$. Focal depth $+0.15$.

	Corr. for Focus	Δ	P.		O-C.	S.		O-C.	Former Residuals.	
			m.	s.		m.	s.		s.	s.
Apia	-0.6	20.3	14	34	-3	19	1	-44	-37	-14
Sydney	-0.7	23.4	5	2	-11	9	8	-11	-10	-9
Melbourne	-1.0	29.7	6	44	+29	11	42	+30	+27	+29
Adelaide	-1.1	32.1	5	26	-12	11	32	-19	-12	-19
Honolulu	-1.5	50.3	18	50	-9	—	—	—	-25	—
Manila	-1.7	54.9	9	30	+3	(17	0)	+1	+6	+9
Osaka	-1.8	58.8	10	0	+8	17	52	+6	+7	+5
Mizusawa	-1.8	60.0	10	1	+1	—	—	—	-1	—
Taihoku	-1.8	60.4	10	17	-14	18	18	+12	+16	-15
Zi-ka-wei	-1.9	64.1	e 10	34	+8	e 18	56	+5	+7	+4
Ootomari	-1.9	66.1	11	48	+69	(20	25)	+70	+64	+62
Calcutta	-2.1	86.2	12	14	-29	(22	56)	-13	-27	-12
Colombo	-2.1	89.5	12	2	-59	21	50	-115	-58	-112

Comparison of the new residuals with the former shows that there is a considerable improvement in the P for Apia and Honolulu; but for the other stations the effects of deep focus and alteration of epicentre neutralise each other. The example is valuable as showing how the effects of a deep focus may be obscured by altering the epicentre and neglecting one or two outstanding results.

Aug. 31d. Records also at 1h. (Helwan and De Bilt), 6h. (Taihoku), 9h. (Azores), 17h. (Kobe), 19h. (La Paz), 22h. (Edinburgh).

Sept. 1-21. For a series of Helwan records see Introductory Note to this number of the Summary (preceding July 1).

Sept. 1d. 13h. 14m. 30s. Epicentre $22^{\circ}0S$. $170^{\circ}0E$. (as on 1919 Jan. 12d.).

$A = -.913$, $B = +.161$, $C = -.375$; $D = +.174$, $E = +.985$;
 $G = -.369$, $H = -.065$, $K = -.927$.

	Δ	Az.	P.		O-C.	S.		O-C.	L.	M.
			m.	s.		m.	s.			
Sydney	20.4	230	4	42	-4	—	—	—	9.6	11.9
Riverview	20.4	230	—	—	—	—	—	—	e 7.1	11.8
Melbourne	26.7	228	—	—	—	10	30	-5	13.5	13.8
Chicago	113.5	51	—	—	—	e 33	30	18R ₁	57.2	—
Helwan	142.2	290	37	30	18R ₁	—	—	—	—	—
De Bilt	147.7	343	—	—	—	—	—	—	e 76.5	85.6
Uccle	149.1	343	—	—	—	—	—	—	e 81.5	83.5
Strasbourg	149.9	333	—	—	—	—	—	—	81.5	—
Azores	159.3	37	—	—	—	—	—	—	—	54.0

Additional records: Riverview gives MN = +10.9m. Chicago L = +45.5m.
De Bilt MN = +87.3m. Helwan PE = +94m.30s., PN = +99m.30s.,
which may represent some later phase of this shock.

Sept. 1d. 19h. 12m. 25s. Epicentre $69^{\circ}0S$. $108^{\circ}0W$.

$A = -.111$, $B = -.341$, $C = -.934$; $D = -.951$, $E = +.309$;
 $G = +.288$, $H = +.888$, $K = -.358$.

	Δ	Az.	P.		O-C.	S.		O-C.	L.	M.
			m.	s.		m.	s.			
Cipolletti	36.8	58	—	—	—	20	59	?	—	22.0
Pilar	44.9	59	—	—	—	—	—	—	—	29.2
Andalgala	47.9	53	—	—	—	—	—	—	—	31.0
La Paz	58.1	47	9	55	-5	17	53	-7	27.2	31.4
Melbourne	60.7	240	18	35	18	(18	35)	+3	29.1	32.1
Sydney	62.4	248	25	35	?	—	—	—	28.8	31.6

Continued on next page.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Riverview	62.4	248	—	—	18 47	- 6	e 27.6	31.5
Capetown	69.9	135	38 53	?L	—	—	(38.9)	50.9
Georgetown	110.3	26	—	—	—	—	53.6	—
Washington	110.3	26	—	—	—	—	e 54.6	—
Chicago	111.8	16	24 35?	?	32 50	?SR ₁	53.6	—
Toronto	114.6	21	—	—	—	—	57.8	—
Ottawa	116.8	25	e 18 11	?PR ₁	—	—	—	53.6
Victoria	118.0	349	—	—	—	—	52.3	54.8
San Fernando	127.8	86	65 27	?L	—	—	(65.4)	109.6
Helwan	134.5	129	38 17	?SR ₁	—	—	—	94.3
Rocca di Papa	141.3	100	—	—	—	—	e 83.7	85.2
Kew	143.0	80	—	—	—	—	—	87.6
Bidston	143.6	79	14 35	?	—	—	—	—
Uccle	144.2	85	e 19 47	[0]	—	—	e 60.6	85.6
De Bilt	145.4	85	—	—	e 31 35	+ 1	e 62.6	79.4
Edinburgh	145.5	75	—	—	—	—	74.6	88.8
Hamburg	148.3	87	20 11	[+18]	—	—	e 78.6	83.6

Additional records: Riverview gives MN = +31.1m. Chicago L = +42.6m.
 Ottawa eN = +18m.11s., eLN = +57.6m. Helwan PN = +37m.53s..
 MN = +37.9m. De Bilt e = +42m.23s., MN = +84.7m. Hamburg
 P is on Z machine, MN = +90.6m. Eskdalemuir ($\Delta = 145^\circ \pm$) records simply
 20h. to 21h. 30m.

Sept. 1d. Records also at 0h. (Batavia and San Fernando), 6h. (Zi-ka-wei and Azores), 7h. (San Fernando), 12h. (Riverview), 13h. (Apia), 16h. (Mizusawa), 20h. (San Fernando, Colombo, Kodaikanal, and Simla), 21h. (close to Athens).

Sept. 2d. Records at 9h. (Helwan), 14h. (Lick and Helwan), 18h. (Mizusawa), 21h. 22m. 25s. (close to Berkeley, which records iP = +3s., iL = +6s., MN = +7s.).

Sept. 3d. Records at 0h. (Lick and San Fernando), 2h. (La Paz), 3h. (Apia), 9h. 6m. 20s. (near La Paz, which records P = +1m.20s., S = +2m.1s., L = +2.7m.), 10h. (Helwan), 11h. (Helwan), 14h. (La Paz), 17h. (Mizusawa, Ootomari, and De Bilt), 18h. (Hamburg and Helwan), 20h. (San Fernando).

Sept. 4d. Records at 7h. (San Fernando), 11h. (Ascension), 12h. 27m. (near Batavia), 15h. (Lick), 20h. 15m. 45s. (close to Berkeley, which records iPEN = +3s., iPV = +4s., iLMEN = +5s., iLMV = +6s.; Lick gives e = +23s.), 20h. 39m. (Berkeley).

Sept. 5d. 7h. 52m. 20s. Epicentre $32^\circ 0'N$. $74^\circ 0'E$.

$$A = +.234, B = +.815, C = +.530.$$

(Very doubtful.)

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.
Simla	2.8	108	i 0 52	+ 8	—	—	—
Bombay	13.1	185	5 33	?S	(5 33)	-13	—
Calcutta	15.9	123	3 40	-12	—	—	8.7
Helwan	36.4	277	24 40	?	—	—	—
Hamburg	49.7	317	—	—	—	—	e 26.7
De Bilt	52.7	315	—	—	e 13 40	?	—

Helwan PN = +21m.40s.

Sept. 5d. 16h. 52m. 12s. Epicentre $18^{\circ}0'N$. $133^{\circ}0'E$.

$$A = -.649, B = +.696, C = +.309; \quad D = +.731, E = +.682; \\ G = -.211, H = +.226, K = -.951.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	12.1	256	e 2 56	- 4	5 12	- 9	5.9	6.3
Taihoku	12.9	305	3 13	+ 1	—	—	4.5	—
Kobe	16.6	6	—	—	8 11	+62	—	11.2
Zi-ka-wei	16.8	324	e 4 6	+ 4	—	—	—	—
Colombo	52.9	267	30 48	?L	—	—	(30.8)	—
Helwan	90.8	301	62 48	?L	—	—	(62.8)	—
Hamburg	93.5	330	—	—	—	—	e 47.8	49.8
De Bilt	96.6	330	e 31 44	?SR ₁	—	—	e 46.8	52.4
Uccle	97.8	330	—	—	—	—	e 48.8	52.8
Rocca di Papa	98.7	319	—	—	—	—	e 54.5	63.6

Helwan gives also $PN = +52.8m.$ ($=LN?$).

Sept. 5d. 19h. 2m. 10s. Epicentre $19^{\circ}5'N$. $65^{\circ}0'W$. (as later on Sept. 6d. 9h.?).

$$A = +.398, B = -.854, C = +.334.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Vieques	1.4	200	0 52	+31	—	—	1.1	1.9
Washington	22.0	334	5 12	+ 7	9 25	+20	e 15.3	—
Chicago	29.4	324	5 16	-66	11 0	-24	14.1	—
La Paz	36.1	186	—	—	—	—	23.2	24.7
De Bilt	62.6	40	—	—	—	—	e 30.8	35.7
Florence	66.9	49	9 34	-83	—	—	—	—
Helwan	85.6	60	55 50	?L	—	—	(55.8)	—

Additional records: Vieques $LN = +1.6m.$

Washington $T_0 = 19h.2m.15s.$

De Bilt $eLN = +32.8m.$, $MN = +39.6m.$

Helwan $P = +54m.50s.$

Sept. 5d. 20h. 37m. 20s. Epicentre $47^{\circ}5'N$. $15^{\circ}8'E$. (as on 1917 Aug. 8d.).

$$A = +.650, B = +.184, C = +.737.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Vienna	0.8	i 0 7	- 5	—	—	0.6	0.6
Zurich	4.9	e 1 4	-12	i 2 40	+26	—	—
Strasbourg	5.5	e 1 38	+13	3 10	+39	—	—
De Bilt	8.3	—	—	e 4 41	+56	—	—

Additional records: Vienna $iZ = +10s.$, $MN = +0.6m.$, $MZ = +0.8m.$

Zurich $eV = +1m.1s.$, $eE = +1m.5s.$, $iSE = +2m.39s.$

Sept. 5d. Records also at 2h. (San Fernando), 3h. (Manila (2)), 4h. and 5h. (3) (Taihoku), 6h. (Taihoku (2) and Zi-ka-wei), 7h. (Taihoku and Zi-ka-wei), 8h. (near Mizusawa), 15h. (Helwan, De Bilt, Uccle, Athens, and Moncalieri), 16h. (Melbourne and Azores), 18h. (near Lick).

1919. Sept. 6d. 9h. 29m. 45s. Epicentre $19^{\circ}5'N$. $65^{\circ}0'W$.

(as on Sept. 5d.).

$$A = +.398, B = -.854, C = +.334; \quad D = -.906, E = -.423; \\ G = +.141, H = -.303, K = -.943.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Vieques	N. 1.4	200	0 30	+ 9	—	—	—	1.6
	E. 1.4	200	0 31	+10	—	—	—	1.6
Port-au-Prince	7.0	264	0 44	-62	2 14	-56	2.5	2.8
Cheltenham	N. 21.8	335	5 0	- 3	9 3	+ 2	12.2	19.5
	E. 21.8	335	5 0	- 3	9 3	+ 2	10.9	16.3
Georgetown	N. 22.0	334	e 4 58	- 7	i 9 3	- 2	e 11.0	—
	E. 22.0	334	e 5 3	- 2	i 9 3	- 2	e 11.0	—
Washington	22.0	334	5 5	0	9 5	0	12.2	—
Ithaca	N. 24.9	340	5 59	+22	10 22	+21	11.5	—
	E. 24.9	340	—	—	10 18	+17	11.5	—

Continued on next page.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Northfield		25.5	347	e 6 35	+52	9 59	-14	e 15.2	—
Toronto		27.0	337	6 15	+17	—	—	11.4	15.2
Ottawa		27.4	344	—	—	(e 10 33)	-15	e 10.6	—
Ann Arbor	N.	27.7	330	7 21	+76	—	—	13.2	19.2
	E.	27.7	330	—	—	—	—	13.0	19.0
Chicago		29.4	324	5 45	-37	11 5	-19	14.2	—
La Paz		36.1	186	i 7 9	-14	15 10	?SR ₁	21.6	24.6
Coimbra		52.3	53	e 8 23	-59	i 15 41	-67	23.0	28.2
Berkeley		52.6	305	—	—	—	—	e 26.2	—
San Fernando		53.8	60	33 15	?L	—	—	(33.2)	35.2
Victoria		54.6	319	20 3	?	—	—	28.4	35.3
Eskdalemuir		58.1	36	—	—	i 17 49	-11	27.2	—
Edinburgh		58.2	36	17 51	?S	(17 51)	-10	28.2	33.6
Oxford		58.6	41	10 6	-3	18 1	-5	e 27.3	33.4
Tortosa		59.1	53	10 3	-3	18 13	+1	26.2	38.2
Kew		59.2	41	—	—	—	—	—	27.2
Barcelona		60.3	52	—	—	—	—	e 29.0	34.2
Paris		60.8	44	—	—	—	—	e 27.2	35.2
Uccle		62.0	42	e 10 21	-4	18 45	-3	e 29.2	44.2
De Bilt		62.6	40	10 32	+3	18 55	-1	e 29.2	35.2
Strasbourg		64.2	45	e 10 15	-24	—	—	—	—
Moncalieri		64.3	49	e 10 36	-4	19 13	-4	26.6	—
Hamburg		65.6	39	e 10 49	0	i 19 31	-1	e 30.2	37.2
Rocca di Papa		68.2	51	e 20 4	?S	(e 20 4)	0	e 32.6	33.8
Lemberg		74.6	42	—	—	e 21 15	-6	e 43.6	44.5
Helwan		85.6	60	23 15	?S	(23 15)	-11	—	—

Additional records: Port-au-Prince $T_0 = 9h.28m.39s.$ Cheltenham $T_0 = 9h.29m.11s.$ Georgetown $LE = +12.1m., LN = +12.2m., T_0 = 9h.29m.36s.$
Washington $L = +15.1m., T_0 = 9h.29m.49s.$ Ithaca $T_0 = 9h.30m.18s.$
Toronto $eL = +13.8m.$ Ottawa $L? = +46.3m.$ Ann Arbor $P = +0m.21s.$ and $S = +7m.21s. (=P?).$ Chicago $L = +33.2m., +50.2m., T_0 = 9h.28m.47s.$ La Paz $T_0 = 9h.26m.56s.$ Coimbra apparently time 1min. in error, also $ePN = +11m.15s., MN = +23.8m.$ San Fernando $MN = +37.2m.$ Eskdalemuir $iN = +17m.54s.$ Edinburgh $S = +23m.59s.$ Uccle $T_0 = 9h.29m.42s.$ De Bilt $eE = +22m.59s. = SR_1?, eN = +23m.11s. = SR_1?, MN = 40.1m., T_0 = 9h.29m.56s.$ Helwan $(S?) = +24m.15s.$

Sept. 6d. Records also at 1h. (Georgetown and Washington), 4h.42m.50s. (close to Taihoku $P = +9s., L = +17s.;$ Zi-ka-wei $e = +3m.24s.$), 6h. (Taihoku), 7h. (Dehra Dun), 8h.35m. (Taihoku and Zi-ka-wei; repetition of 4h.42m.?), 10h. (San Fernando), 11h. (Florence), 12h. (Ascension), 14h. (Manila and Riverview), 15h. (Melbourne, Helwan, and Azores; possibly same as Manila 14h.), 16h. (Apia), 20h. (Azores), 21h. (Batavia).

Sept. 7d. 18h. 21m. 43s. Epicentre $24^\circ 0'N. 120^\circ 0'E.$ (as on 1917 Jan. 4d.).

$$A = -.457, B = +.792, C = +.407.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku	1.8	53	0 28	0	—	—	—	—
Zi-ka-wei	7.3	10	—	—	e 3 23	+5	—	—
Manila	9.5	172	—	—	e 3 30	-46	—	—
De Bilt	85.2	326	—	—	—	—	e 47.3	48.3

De Bilt gives $MN = +48.5m.$

Sept. 7d. 20h. 21m. 16s. (La Paz). Epicentre $29^\circ 0'S. 98^\circ 0'W.$ (rough).

$$A = -.122, B = -.866, C = -.485; D = -.996, E = +.139; G = +.067, H = +.480, K = -.875.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Cipolletti	26.6	120	12 38	?S	(12 38)	+125	15.7	16.7
Andalgala	27.9	95	—	—	—	—	21.2	24.9
Pilar	29.5	104	11 38	?S	(11 38)	+12	—	19.3
	N.	29.5	104	5 20	-63	—	14.3	16.5
La Paz	30.1	72	6 37	+8	11 51	+15	14.9	17.4
De Bilt	120.3	44	—	—	e 38 8	?SR ₁	e 61.7	—

Andalgala gives $MN = +21.7m.$

Sept. 7d. Records also at 1h. (Athens), 11h. (14' from La Paz), 17h. (Rocca di Papa), 20h. (Azores), 21h. (Helwan).

Sept. 8d. 4h. 8m. 0s. Epicentre $18^{\circ}0'N$. $97^{\circ}0'E$. (as on 1917 April 12d.).

$$A = -.116, B = +.944, C = +.309; \quad D = +.993, E = +.122;$$

$$G = -.038, H = +.307, K = -.951.$$

The Batavia observations suggest an epicentre some $2^{\circ}0'S$., and it must then be further West to suit Calcutta and Manila. But the material is so slight that this old epicentre has been retained.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Calcutta	9.3	300	2 30	+10	—	—	7.6	—
Colombo	20.1	239	11 18	?L	—	—	(11.3)	12.5
Manila	23.2	87	e 5 36	+17	—	—	12.7	14.5
Taihoku	23.8	69	14 19	?L	—	—	(14.3)	—
Zi-ka-wei	25.7	55	—	—	—	—	e 13.8	—
Batavia	26.0	158	e 5 19	-29	9 36	-46	—	12.3
Helwan	60.4	295	34 0	?L	—	—	(34.0)	—
De Bilt	E. 77.0	321	—	—	—	—	e 52.0	52.7
	N. 77.0	321	—	—	—	—	e 47.0	47.7

Manila gives MN = $\pm 15.0m$.

Helwan PN = $\pm 41m.0s$.

Sept. 8d. 14h. 4m. 10s. Epicentre $24^{\circ}0'N$. $120^{\circ}0'E$. (as on Sept. 7d.).

$$A = -.457, B = +.792, C = +.407.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.8	53	0 28	0	—	—	—	—
Zi-ka-wei	7.3	10	—	—	e 3 34	+16	—	—
Manila	9.5	172	2 30	+7	—	—	—	—
De Bilt	85.2	326	—	—	—	—	e 46.8	48.2

Sept. 8d. Records also at 1h. (Manila), 2h., 3h., 4h., 5h., and 7h. (Azores), 8h. (Mizusawa), 9h. (San Fernando), 11h. (Azores), 16h. (Milan), 17h. (Lick), 18h. (Zurich), 19h., 20h., and 23h. (Azores).

Sept. 9d. Records at 5h. (La Paz, Apia, and Tokyo), 17h. (near Mizusawa), 18h. (San Fernando), 19h. (Azores and near La Paz), 21h. and 22h. (Azores).

Sept. 10d. 10h. 40m. 0s. Epicentre $41^{\circ}5'N$. $7^{\circ}0'W$. (as on 1918 Dec. 25d.).

$$A = +.744, B = -.091, C = -.663; \quad D = -.122, E = -.992,$$

$$G = +.658, H = -.081, K = -.749.$$

There is some difficulty in separating this shock from that following. Possibly Coimbra observes the latter, though an error of 3 minutes seems more likely, and has been assumed in the columns O-C.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Coimbra	1.7	220	(3) 18	(- 8)	(3) 58	(+10)	—	4.5
Granada	5.1	148	i 1 20	+1	i 1 50	-30	—	—
San Fernando	5.1	173	2 16	?S	(2 16)	-4	3.5	4.0
Tortosa	5.7	94	1 22	-6	—	—	2.3	2.8
Barcelona	6.8	87	1 36	-8	—	—	2.3	3.8
Algiers	9.1	118	1 56	-22	—	—	—	4.7
Marseilles	9.3	75	e 3 25	?S	(e 3 25)	-45	—	—
Moncalieri	11.2	67	e 2 40	-7	5 18	-19	6.7	7.9
Zurich	12.5	57	e 3 23	+17	e 6 36	-64	—	—
Rocca di Papa	14.7	82	3 36	+1	—	—	e 8.3	12.7

Additional records: Coimbra MN = $\pm 4.2m$.

San Fernando Milne machines

PN = $\pm 3m.0s$., PE = $\pm 3m.30s$., M = $\pm 4m.0s$.

Sept. 10d. 10h. 44m. 30s. Epicentre $44^{\circ}0'N$. $2^{\circ}5'E$. (as on 1913 Feb. 5d.).

$A = +.719$, $B = +.031$, $C = +.695$.

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Besancon	4.0	1 33	+31	2 45	+55	6.5	—
Paris	4.9	e 0 40	-36	e 2 6	- 8	2.5	3.0
Strasbourg	5.8	e 2 0	+30	—	—	e 3.3	—
Uccle	6.9	e 1 54	+ 9	e 3 4	- 3	e 4.8	5.3
Oxford	8.2	i 3 4	+60	3 36	- 6	—	4.9
De Bilt	8.3	—	—	e 3 49	+ 4	4.2	6.3
Hamburg	10.8	—	—	e 6 15	+85	e 22.5	24.0
Edinburgh	12.5	5 30	?S	(5 30)	- 2	—	7.5

Additional records : Paris ePV = +0m.55s. The printed record is PN. The Hamburg record for L and M probably refer to the next shock, and the S record is then probably L.

Sept. 10d. 10h. 56m. 5s. Epicentre $41^{\circ}5'N$. $7^{\circ}0'W$. (as at 10h.40m.).

It is assumed as before that Coimbra is 3m. in error.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Coimbra	1.7	220	e (3) 19	- 7	i (4) 3	+15	—	4.6
Granada	5.1	148	1 36	+17	—	—	—	—
San Fernando	5.1	173	2 25	?S	(2 25)	+ 5	3.5	3.7
Tortosa	5.7	94	1 30	+ 2	—	—	2.3	2.9
Barcelona	6.8	87	1 45	+ 1	—	—	2.5	3.8
Algiers	9.1	118	2 3	-15	4 3	- 3	4.5	—
Marseilles	9.3	75	e 3 53	?S	(e 3 53)	-17	—	—
Oxford	11.0	19	—	—	—	—	8.3	9.2
Strasbourg	12.5	50	—	—	e 4 35	-57	e 8.1	—
Helwan	32.9	98	5 55	-61	—	—	—	—

The above shock appears to be followed by another at the second epicentre $4\frac{1}{2}$ minutes later, as before; to facilitate comparison the precise interval, 4m.30s., has been retained. Coimbra MN = +4.3m.

Sept. 10d. 11h. 0m. 35s. Epicentre $44^{\circ}0'N$. $2^{\circ}5'E$. (as at 10h.44m.).

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Besancon	4.0	1 23?	+21	2 38	+48	3.4	—
Paris	4.9	e 0 51	-25	e 2 18	+ 4	3.4	3.4
Strasbourg	5.8	e 0 5	?	—	—	e 3.5	—
Uccle	6.9	2 1	+16	e 3 11	+ 4	—	—
De Bilt	8.3	—	—	—	—	4.3	4.7
Edinburgh	12.5	5 55	?S	(5 55)	+23	—	7.3

De Bilt gives MN = +6.4m.

Sept. 10d. 11h. 58m. 30s. Epicentre $41^{\circ}5'N$. $7^{\circ}0'W$. (as at 10h.56m.5s.).

It is assumed, as before, that Coimbra is 3m. in error.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Coimbra	1.7	220	e (3) 46	+20	(4) 19	+31	—	—
Granada	5.1	148	1 27	+ 8	—	—	—	—
Tortosa	5.7	94	1 19	- 9	—	—	2.1	2.6
Barcelona	6.8	87	e 2 54	?S	(2 54)	-11	3.1	3.7
Oxford	11.0	19	—	—	—	—	—	8.9
Helwan	32.9	98	11 30	?S	(11 30)	-52	—	—

Sept. 10d. 12h. 3m. 0s.? Epicentre $44^{\circ}0'N$. $2^{\circ}5'E$. (as at 11h.0m.). The only indications are De Bilt eL = +4.1m., ME = +4.6m., MN = +6.2m.; but these are in such good accordance with former records that the possibility seems worth recording.

Sept. 10d. 14h. 21m. 50s. Epicentre $41^{\circ} \cdot 5N$, $7^{\circ} \cdot 0W$. (as at 11h.58m.).

(Coimbra 3m. in error, as before).

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Coimbra	1.7	220	e 3 50	+24	(4) 16	+28	4.7	—
Granada	5.1	148	1 32	+13	—	—	—	—
Tortosa	5.7	94	1 32	+4	—	—	2.3	2.9
Barcelona	6.8	87	e 2 32	?S	(2 32)	-33	3.5	4.3
Helwan	32.9	98	31 10	?	—	—	—	—

Coimbra gives $iSN = +4m.14s$.

Sept. 10d. 14h. 26m. 20s. Epicentre $44^{\circ} \cdot 0N$, $2^{\circ} \cdot 5E$. (as at 12h.3m.).

(It is assumed that this follows 4m.30s. later as before).

	Δ	S.	O - C.	L.	M.
	$^{\circ}$	m. s.	s.	m.	m.
Paris	4.9	e 2 22	+8	3.7	3.7
Uccle	6.9	e 3 34	+27	—	—
De Bilt	E. 8.3	—	—	e 4.8	6.4
	N. 8.3	—	—	e 5.2	6.4

Note to the foregoing. The suggestion is that a shock under the epicentre $41^{\circ} \cdot 5N$, $7^{\circ} \cdot 0W$., are followed (in each of four cases) after an interval of 4m.30s. by a shock under the epicentre $44^{\circ} \cdot 0N$, $2^{\circ} \cdot 5E$., approximately. The material is scarcely good enough to define the latter with great precision, and its place has been adopted from a former occasion (1918 Feb. 5). The distance between the adopted epicentres is $7^{\circ} \cdot 4$, so that if one shock is caused by the other it must be by the L waves. The times adopted are:

h.	m.	s.	m.	h.	m.	s.
10	40	0	+4.9	10	44	30
10	56	5	0.0	11	0	35
11	58	30	-0.6	12	3	0
14	21	50	-4.3	14	26	20

The middle column represents deviations from a series of multiples of 21.0m.

Sept. 10d. 16h. 57m. 20s. Epicentre $43^{\circ} \cdot 0N$, $12^{\circ} \cdot 5E$. (as on 1917 May 11d.).

A = +.714, B = +.158, C = +.682; D = +.216, E = -.976;
G = +.666, H = +.148, K = -.731.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Florence	1.2	311	0 17	-1	—	—	—	0.7
Rocca di Papa	1.3	173	0 19	-1	—	—	—	1.3
Pola	2.1	27	e 0 38	+5	—	—	e 1.0	1.9
Pompeii	2.7	147	0 50	+8	1 29	+15	—	2.2
Milan	3.4	316	0 59	+6	1 45	+11	—	3.9
Moncalieri	4.0	302	0 50	-12	1 38	-12	—	2.5
Marseilles	5.2	276	1 3	-17	—	—	4.6	—
Zurich	5.2	329	e 1 13	-7	i 2 46	+24	—	3.0
Vienna	5.9	26	1 29	-2	—	—	3.0	3.6
Besancon	6.2	315	1 26	-9	3 26	+37	4.7	—
Budapest	6.4	44	0 58	-40	—	—	—	—
Strasbourg	6.5	330	e 1 31	-8	—	—	e 3.4	—
Barcelona	7.8	263	—	—	e 3 40	+9	e 3.9	5.2
Paris	9.0	313	e 2 33	+17	e 4 20	+17	4.9	5.7
Tortosa	9.5	261	2 17	-6	—	—	3.6	7.6
Uccle	9.6	327	e 2 10	-14	—	—	e 4.7	—
Algiers	9.6	232	—	—	e 3 40	-38	12.7	—
De Bilt	10.3	334	—	—	e 4 53	+16	5.5	6.2
Hamburg	10.7	352	—	—	e 4 40	-8	—	7.1
Kew	12.1	319	—	—	—	—	—	7.7
Oxford	12.8	318	—	—	—	—	6.5	7.7
San Fernando	15.7	252	7 40	?L	—	—	(7.7)	9.7
Coimbra	15.8	267	—	—	—	—	e 9.1	10.3
Edinburgh	16.3	328	8 22	?L	—	—	(8.4)	9.6

Eskdalemuir ($\Delta -16^{\circ} \cdot 0$) records simply 17h.5m. to 17h.8m. Additional records Rocca di Papa C inst., $iP = +0m.19s.$, $ME = +1.2m.$, $MN = +1.5m.$ Pola $MN = +1.5m.$ Zurich $iPE = +1m.33s.$, $MN = +3.1m.$ Paris $ePN = +2m.27s.$ Tortosa gives its P 10m. early. De Bilt $MN = +6.4m.$ Hamburg $MN = +9.0m.$, $MZ = +8.0m.$ San Fernando Milne insts. agree except $PN (=LN?) = +7m.40s.$ Coimbra $LN = +7.7m.$

Sept. 10d. Records also at 4h. (San Fernando and Manila), 12h. (La Paz), 15h. Azores (2), 17h. 18m. 50s. (close to Zurich, which gives $eP = +5s.$, $ePN = +9s.$, $iS = +10s.$, Pompeii $P = +7m.39s.$, 17h. 24m. 10s. (again close to Zurich, which gives $eP = +3s.$, $iS = +15s.$, $iME = +16s.$, $M = +23s.$, Rocca di Papa $iP = +44s.$, $M = +2m.8s.$, 18h. 16m. 0s. (close to Azores $P = +6s.$, $M = +2.0m.$), 18h. 17m. 20s. (close to Osaka, $PS = +16s.$, $ME = +0.9m.$, $MN = +1.0m.$), 19h. (San Fernando), 22h. (San Fernando).

Sept. 11d. 0h. 38m. 0s. Further repetition from $41^{\circ}5'N.$, $7^{\circ}0'W.$, as on Sept. 10d.? Coimbra (still 3m. in error?), $eP = +(3)m.36s.$, $S = +(4)m.6s.$, Granada $P = +1m.12s.$, Tortosa $P = +1m.24s.$, $L = +2.1m.$, $M = +2.5m.$

Sept. 11d. 5h. 31m. 0s. Epicentre $24^{\circ}5'N.$, $143^{\circ}5'E.$ (as on 1917 July 1d.).

$$A = -.732, B = +.541, C = +.415; \quad D = +.595, E = +.804; \\ G = -.333, H = +.247, K = -.910.$$

	Δ	Az.	P.	O-C.	S.	O-C.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.
Tokyo	11.6	345	2 43	-10	5 6	- 3	—
Osaka	12.3	327	3 31	+28	—	—	6.7
Mizusawa	14.9	355	4 10	+32	7 11	+41	—
La Paz	149.3	100	19 32	[-22]	—	—	—

If the La Paz record really belongs to this shock, it is remarkable that there should be no records from intermediate stations.

Sept. 11d. 13h. 47m. 50s. Epicentre $11^{\circ}5'N.$, $144^{\circ}0'E.$ (as on 1918 Jan. 12d.).

$$A = -.793, B = +.576, C = +.199.$$

(Very uncertain: perhaps further south).

	Δ	Az.	P.	O-C.	S.	O-C.	L.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.
Manila	22.7	280	—	—	e 10 10	+51	—
Tokyo	24.5	352	5 17	-16	10 4	+10	—
Nagasaki	24.9	331	13 30	?L	—	—	(13.5)
La Paz	148.4	103	—	—	24 2	?PR ₁	—

Sept. 11d. 13h. 49m. 30s. Epicentre $19^{\circ}0'N.$, $68^{\circ}0'W.$ (as on 1917 July 27d.).

$$A = -.354, B = -.877, C = +.326; \quad D = -.927, E = -.375; \\ G = +.122, H = -.302, K = -.946.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Vieques	E. 2.6	107	0 43	- 2	—	—	1.0	1.3
	N. 2.6	107	0 40	- 1	—	—	1.1	1.4
Chicago	28.2	328	11 10	?S	(11 10)	+ 7	(14.1)	—
La Paz	35.5	180	e 12 52	?S	(e 12 52)	-11	43.6	44.9
De Bilt	N. 64.8	40	—	—	—	—	e 29.5	57.4

Chicago gives S as P and L as S, also L = +16.2m. and 19.6m. It seems clear that the La Paz record does not belong to this (comparatively near) epicentre, but possibly to the preceding shock across the globe.

Sept. 11d. 14h. 11m. 30s. Repetition from $19^{\circ}0'N.$, $68^{\circ}0'W.$ (as at 13h. 49m.?). Vieques gives $PE = +31s.$, $PN = -30s.$, $LE = +37s.$, $LN = +36s.$, $ME = +1.2m.$, $MN = +1.3m.$. De Bilt ($\Delta = 64^{\circ}8'$) gives $eLE = +29.5m.$, agreeing with eLN for former shock. The interval between the two is 22.0m.

Sept. 11d. Records also at 0h. (Zurich), 1h. 45m., 2h. 6m., 2h. 29m. (Azores: the intervals are close to 21m.), 10h. (Athens), 12h. (Batavia), 14h. (Helwan), 19h. (San Fernando), 21h. (Tucson and Berkeley), 22h. (De Bilt).

Sept. 12d. 6h. 5m. 40s. Epicentre 42° -0S. 178° -0E. (as on 1918 July 24d.).

A = -·743, B = +·026, C = -·669; D = +·035, E = +·999;
G = +·669, H = -·023, K = -·743.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Sydney	22·6	282	5 2	-10	9 8	- 9	11·6	12·3
Riverview	22·6	282	15 15	+ 3	e 9 16	- 1	e 10·5	12·4
Melbourne	25·5	268	5 38	- 5	11 2	+49	15·6	16·8
Apia	29·5	20	—	—	(11 20)	- 6	11·3	—
Adelaide	31·3	272	—	—	11 50	- 6	17·3	19·8
Batavia	71·9	279	e 11 40	+11	20 58	+ 9	38·9	—
Manila	77·1	305	e 12 0	- 2	—	—	—	—
Mendoza	83·5	130	—	—	—	—	—	54·1
Taihoku	84·9	312	—	—	e 31 20	?SR ₁	—	—
Andalgala	88·6	129	—	—	—	—	—	63·6
La Paz	94·6	120	—	—	27 16	+134	46·2	49·2
Colombo	100·7	270	48 20	?L	—	—	(48·3)	54·3
Helwan	150·6	256	43 20	?L	—	—	(43·3)	—
Edinburgh	166·1	3	—	—	—	—	89·3	111·3
Bidston	168·5	3	84 38	?L	88 44	?	(84·6)	96·3
De Bilt	N. 168·8	337	e 29 2	?	e 45 14	?SR ₁	e 79·3	85·6
Moncalieri	172·4	296	e 24 36	?PR ₁	45 36	?	89·8	—
Tortosa	177·8	238	22 20	—	—	—	107·3	110·6

Eskdalemuir (Δ = 166°·6) gives simply 6h.40m. to 8h.26m. Additional records: Riverview gives iP = +5m.32s., iPS = +9m.27s., T₀ = 6h.5m.37s. Melbourne SR₁ = +13m.26s. Adelaide PR = +9m.20s., SR = +12m.56s. La Paz gives T₀ = 6h.9m.18s. Helwan PN = +45m.20s. = LN? De Bilt eE = +31m.50s.

Sept. 12d. 6h. 57m. 30s. A shock is recorded at several stations, but it is difficult to assign the epicentre. The time is taken from Kodaikanal, which records P = +5m.48s., L = +14·1m., M = +16·6m., indicating Δ = 28°. But Coimbra gives eL = +36·2m.; Edinburgh L = +37·5m., M = +59·5m.; Paris eL = +41·5m.; Algiers eL = +45·5m., M = +50·0m.; and San Fernando P = +51·5m., and these are not accordant enough to identify the epicentre.

Sept. 12d. 12h. 23m. 40s. Epicentre 42° -0S. 178° -0E. (as at 6h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Sydney	22·6	282	4 50	-22	—	—	11·1	11·9
Riverview	22·6	282	e 5 19	+ 7	—	—	e 11·0	12·1
Melbourne	25·5	268	—	—	11 20	+67	15·7	16·8
Adelaide	29·5	20	—	—	11 44	+18	17·2	19·5

Additional records: Riverview MN = +12·0m. Melbourne SR = +13m.38s. Adelaide SR = +13m.50s.

Sept. 12d. 13h. 49m. 40s. Epicentre 48° -0N. 148° -0E.

A = -·567, B = +·355, C = +·743; D = +·530, E = +·848;
G = -·630, H = +·394, K = -·669.

It seems possible that there were two shocks; for instance, the Moncalieri observations can scarcely be explained otherwise.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	3·8	249	1 33	+34	(1 33)	-11	2·9	3·0
Mizusawa	E. 10·1	211	2 5	-26	3 48	-44	—	—
	N. 10·1	211	2 11	-20	3 51	-41	—	—
Tokyo	13·8	209	5 50	?S	6 12	+ 9	12·2	—
Osaka	16·3	220	4 36	+40	—	—	—	11·3
Zi-ka-wei	26·3	240	—	—	e 12 0	+92	—	—
Taihoku	31·0	231	—	—	e 13 20	+89	—	—
Manila	40·2	224	10 20	?PR ₁	—	—	—	—
Honolulu	50·4	102	—	—	—	—	e 27·3	32·8
Hamburg	72·4	337	—	—	—	—	e 40·3	45·4

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
De Bilt	N.	75.0	339	—	—	e 21 44	+18	e 43.3	48.3
	E.	75.0	339	—	—	—	—	e 41.3	46.2
Vienna	Z.	75.0	330	i 11 52	+ 3	—	—	e 43.3	—
Uccle		76.4	339	e 11 50	- 7	—	—	—	52.3
Kew		76.9	342	—	—	—	—	—	50.3
Strasbourg		77.5	334	e 12 30	+26	—	—	45.8	48.3
Chicago		77.7	40	11 35	-30	19 52	-125	33.3	—
Paris		78.6	340	i 12 10	- 1	e 22 24	+17	43.3	47.3
Moncalieri		80.7	333	e 8 39	-224	16 40	-351	40.8	49.2
Rocca di Papa		81.9	329	e 12 8	-22	22 44	- 1	53.7	—
Barcelona		85.6	336	—	—	—	—	e 50.0	52.4
Coimbra		89.3	344	—	—	—	—	e 54.4	—
Algiers		89.6	332	—	—	—	—	—	50.3

Eskdalemuir gives simply 14h. to 15h.30m. Additional records: Osaka
 MN = +11.0m. Hamburg MN = +43.3m. Chicago L = +47.3m.,
 T₀ = 13h.51m.1s. Rocca di Papa S = +18m.56s., L = +55.7m. Helwan
 gives PE = +1m.20s., PN = +9m.20s.

Sept. 12d. 14h. 26m. 37s. Epicentre 72°0N. 2°8W. (as on Feb. 2d.).

A = +.309, B = -.015, C = +.951; D = -.049, E = -.999;
 G = +.950, H = -.046, K = -.309.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Edinburgh		16.1	184	3 47	- 6	6 59	+ 2	9.4	13.0
Bidston		18.6	180	1 53	?	7 41	-12	—	15.4
Florence		29.0	159	5 23	-55	—	—	—	11.9
San Fernando		35.6	184	18 23	?L	—	—	(18.4)	—
Colombo		81.2	96	11 23	-63	—	—	—	—

Is it possible that the Edinburgh records are 1m. in error, and that T₀ should be diminished by 1m. ? It is curious that other stations are silent.

Sept. 12d. 14h. 52m. 20s. Epicentre 36°1N. 137°3E. (as on 1918 Nov. 11d.).

A = -.594, B = +.548, C = +.589.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo		2.0	100	0 52	+21	1 58	+63	3.6	—
Osaka		2.1	218	2 35	?	—	—	—	8.2
Mizusawa		4.3	45	1 10	+ 3	1 48	-10	—	—
Ootomari		11.3	19	1 56	?	—	—	3.0	—
Zi-ka-wei		14.1	254	9 41	?	—	—	—	—
Vienna	Z.	80.7	325	i 12 25	+ 2	—	—	—	—
De Bilt		82.5	332	—	—	—	—	e 39.7	44.6
Strasbourg		84.3	329	—	—	—	—	50.7	—
Paris		86.1	332	—	—	—	—	e 45.7	—
Algiers		95.7	324	—	—	(e 25 40)	+27	e 25.7	53.7
La Paz		150.1	56	18 51	[-65]	—	—	—	—

Osaka gives MN = +7.6m. De Bilt eLN = +42.7m., MN = +53.5m.

Sept. 12d. Records also at 1h. (Batavia and De Bilt), 2h. (Tokyo and Azores), 4h. (La Paz), 13h. (De Bilt and Bidston), 16h.17m. (close to Rocca di Papa), 17h. (Taihoku), 19h. (Helwan and Paris), 21h. (Helwan and De Bilt).

1919. Sept. 13d. 12h. 19m. 10s. (I) } Epicentre 15° 2S. 61° 0W.
 20m. 8s. (II) } But see note at end.

A = +.468, B = -.844, C = -.262; D = -.875, E = -.485;
 G = -.127, H = +.229, K = -.965.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz		7.0	258	1 38	- 8	—	—	3.4	3.7
Andalgala		13.3	201	12 38	(-39)	15 38	(-13)	—	16.6
Pilar	E.	16.7	188	3 56	- 5	—	—	8.9	13.0
	N.	16.7	188	7 32	?8	(7 32)	+21	8.9	15.1
Rio de Janeiro		18.5	117	6 14	+111	11 38	?	16.7	19.8
Mendoza		18.9	200	8 8	?8	(8 8)	+ 8	—	11.1
Cipolletti		24.6	193	8 2	+148	(10 20)	+25	10.3	13.8
Vieques		33.6	354	12 50	?8	(12 50)	+16	—	19.5
Washington		56.1	347	9 47	0	17 32	- 3	34.8	—
Georgetown		56.1	347	e 9 48	+ 1	i 17 36	+ 1	35.6	—
Ithaca		59.4	350	11 5	+57	19 7	+51	i 32.8	—
Ann Arbor		61.2	344	—	—	—	—	30.8	—
Toronto		61.2	347	7 8	?	—	—	25.9	38.2
Chicago		62.0	340	10 5	-20	19 12	+24	32.2	—
Ottawa		62.1	350	i 10 30	+ 4	i 18 54	+ 5	30.8	—
Cape Town		73.0	122	22 56	?8	(22 56)	+114	46.9	52.5
San Fernando		73.0	45	11 50	+14	—	—	—	50.8
Coimbra		73.9	40	12 33	+52	23 1	+108	37.5	50.3
Granada		75.1	45	13 24	+94	23 55	+148	—	—
Algiers		79.6	48	—	—	e 23 32	+73	25.3	54.8
Tortosa		79.8	43	13 10	+52	23 40	+79	40.4	52.7
Barcelona		81.2	44	14 15	+109	23 44	+67	e 37.2	47.2
Victoria		84.2	325	13 20	+37	22 11	-59	34.5	52.2
Bidston		84.5	31	14 14	?	—	—	—	51.5
Oxford		84.6	33	i 13 25	+39	23 52	+37	—	50.4
Kew		84.9	33	—	—	—	—	—	52.8
Paris		85.1	37	13 26	+37	i 24 1	+41	43.8	52.8
Eskdalemuir		85.5	30	—	—	i 24 1	+36	42.8	—
Edinburgh		85.9	30	13 30	+37	23 58	+29	44.8	53.5
Moncalieri		86.4	42	13 33	+38	23 41	+ 7	37.3	57.8
Uccle		87.1	36	e 13 34	+34	24 12	+30	e 41.8	55.8
Strasbourg		88.0	40	e 13 44	+39	—	—	e 40.8	52.8
De Bilt		88.3	35	13 41	+34	24 22	+27	e 49.8	55.1
Rocca di Papa		88.4	47	e 13 51	+44	e 24 21	+25	e 54.5	—
Pompeii		89.3	49	16 50	?PR ₁	24 30	+24	—	—
Hamburg		91.4	35	e 14 26	+63	i 24 38	+10	e 47.8	55.8
Vienna	z.	93.1	40	18 15	?PR ₁	—	—	e 45.8	60.3
Helwan		99.5	62	20 44	?PR ₁	—	—	—	69.8
Honolulu		101.9	290	—	—	—	—	22.8	24.8
Bombay		135.8	79	19 8	[-24]	—	—	—	27.1
Kodaikanal		139.2	90	—	—	—	—	31.5	31.8
Colombo		140.7	96	23 50	?PR ₁	—	—	—	30.8
Calcutta		150.1	70	19 38	[-18]	—	—	22.0	—
Manila		178.0	252	—	—	e 31 50	?	—	—

Additional records: La Paz $T_0 = 12\text{h.}18\text{m.}58\text{s.}$. Andalgala: In forming O-C. an error of 10min. has been assumed; MN = +16.4m. Pilar, S is entered as PN. Washington $T_0 = 12\text{h.}19\text{m.}17\text{s.}$. Georgetown records also i at +22m.27s. and +35m.36s. Ithaca iN = +19m.8s. Toronto two early records at i = 12h.19m.6s. and i = 12h.20m.48s., and several L records +15.2m., +19.3m., +34.7m., and eL = +36.6m. Chicago L = +39.3m., $T_0 = 12\text{h.}18\text{m.}7\text{s.}$. Ottawa, P is entered as iN and S as iE; also iV = +2m.30s., eLE = +25.8m., L = +36.8m. San Fernando, Milne machine gives P = +12m.38s. Coimbra $SR_1 = +28\text{m.}2\text{s.}$, MN = +47.6m., $T_0 = 12\text{h.}19\text{m.}13\text{s.}$. Barcelona MN = +55.0m. Paris $PR_1 = +17\text{m.}12\text{s.}$, MN = +43.8m., $T_0 = 12\text{h.}19\text{m.}58\text{s.}$. Edinburgh $PR_1 = +17\text{m.}2\text{s.}$, $PR_2 = +19\text{m.}10\text{s.}$, $SR_1 = +29\text{m.}58\text{s.}$. Uccle $T_0 = 12\text{h.}20\text{m.}4\text{s.}$. De Bilt $PR_1 = +17\text{m.}33\text{s.}$, eSN = +25m.4s., e = +26m.26s., MN = +52.2m., $T_0 = 12\text{h.}19\text{m.}22\text{s.}$. Hamburg $T_0 = 12\text{h.}21\text{m.}24\text{s.}$. Helwan PN = +21m.2s., MN = +65.9m.

There seems to have been several shocks. One, earlier than those tabulated, near Toronto and Ottawa; see the notes to those stations. Possibly one later than those tabulated, as shown in the Table by Rio de Janeiro, Mendoza, and Cipolletti. The double shock indicated at head seems to be a case where a larger shock follows a smaller, the smaller being caught at the near stations,

Continued on next page.

while only the larger reaches the distant ones. The records have all been referred to $T_0(1)=12\text{h.}19\text{m.}10\text{s.}$, and those which show the later shock are presumed to be

	Δ °	P. s.	S. s.		Δ °	P. s.	S. s.
Ithaca	59.4	+ 57	+ 51	Moncalieri	86.4	+38	+ 7
Coimbra	73.9	+ 52	+108	Uccle	87.1	+34	+30
Granada	75.1	+ 94	+148	Strasbourg	88.0	+39	—
Algiers	79.6	—	+ 73	De Bilt	88.3	+34	+27
Tortosa	79.8	+ 52	+ 79	Rocca di Papa	88.4	+44	+25
Barcelona	81.2	+109	+ 67	Hamburg	91.4	+63	+10
Paris	85.1	+ 83	+ 41				
Edinburgh	85.9	+ 37	+ 29	Mean		+57	+53

The range of these residuals is considerable, and the mean values cannot be regarded very seriously: but part of the discordance may be due to the errors of the Tables near $\Delta=90^\circ$. The general accordance of P and S suggests that the epicentre is correct, and the testimony of La Paz, Pilar, Washington, Georgetown, and Ottawa seems sufficient to establish the earlier shock.

Sept. 13d. 17h. 29m. 10s. Epicentre $15^\circ 28'$. $61^\circ 0' \text{W.}$ (as at 12h.).

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz	7.0	258	1 1 40	- 6	2 45	-25	3.2	4.8
Andalgala	13.3	201	—	—	16 2	(+11)	—	16.6
Pilar	16.7	188	9 8	?	—	—	14.7	15.3
Mendoza	18.9	200	6 38	+130	7 38	-22	—	8.2
Cipolletti	24.6	193	10 8	?S	(10 8)	+13	—	23.0
Uccle	87.1	36	—	—	e 24 8	+26	—	55.8
De Bilt	88.3	35	—	—	e 24 20	+25	e 50.8	52.5

De Bilt $eN = +25\text{m.}2\text{s.}$, $MN = +53.4\text{m.}$ Andalgala has been again assumed to be 10min. in error, and generally the residuals, though not always small, accord with those of the shock at 12h. $MN = +16.3\text{m.}$ We may note that the interval $17\text{h.}29\text{m.}10\text{s.} - 12\text{h.}19\text{m.}10\text{s.} = 310\text{m.} = 15 \times 21\text{m.} - 5\text{m.}$

Sept. 13d. 18h. 11m. (30s.). Epicentre $44^\circ 0' \text{N.}$ $20^\circ 0' \text{W.}$ (as on 1918 Jan. 14d.).

$$A = +.676, B = -.246, C = +.695.$$

Edinburgh ($\Delta = 16^\circ 0'$) $P = +7\text{m.}30\text{s.} = L?$ Paris ($\Delta = 16^\circ 2'$) $eL = +7.5\text{m.}$
 Strasbourg ($\Delta = 19^\circ 6'$) $L = +10.5\text{m.}$ Hamburg ($\Delta = 21^\circ 7'$) $eL = +11.5\text{m.}$
 Helwan ($\Delta = 42^\circ 6'$) $PE = +17\text{m.}30\text{s.}$, $PN = +12\text{m.}30\text{s.}$
 Colombo ($\Delta = 92^\circ 2'$) $P = +43.5\text{m.} = L?$

Sept. 13d. 21h. 49m. 10s. Epicentre $18^\circ 2' \text{N.}$ $68^\circ 2' \text{W.}$ (as on 1918 Nov. 12d.).

$$A = +.353, B = -.882, C = +.312.$$

		Δ °	Az. °	P. m. s.	O-C. s.	L. m.	M. m.
Vieques	E.	2.6	89	0 42	+ 1	1.0	1.3
	N.	2.6	89	0 41	0	1.2	1.3
La Paz		34.7	179	e 9 30	+139	21.2	23.3
De Bilt	E.	65.6	39	—	—	e 30.8	35.5
Helwan		88.9	58	55 50	? —	—	—
Colombo		139.7	54	85 50	?L	(85.8)	—

Sept. 13d. Records also at 0h. (Batavia), 1h. (Colombo), 5h. (Mizusawa (2)), 6h. (San Fernando), 9h. (Barcelona and La Paz), 10h. (Vienna and Rocca di Papa), 11h. (Colombo, Uccle, De Bilt, Strasbourg, Hamburg, Paris, Helwan, Algiers, and Toronto), 13h. (Melbourne, La Quiaça, Zi-ka-wei, Mizusawa, Colombo, Kodaikanal, and Manila), 14h. (Toronto, La Paz, and Azores), 16h. (Helwan), 17h. (Apia), 18h. (near La Quiaça), 21h. (Paris).

Sept. 14d. 1h. 43m. 0s. Repetition from $15^\circ 28'$. $61^\circ 0' \text{W.}$ (as on Sept. 13d. 12h. and 17h.). La Paz gives $P = +1\text{m.}52\text{s.}$, $S = +3\text{m.}2\text{s.}$, $L = +3.3\text{m.}$, $M = +4.7\text{m.}$

Sept. 14d. 3h. 40m. 30s. Further repetition from $15^{\circ}2\text{S}$. $61^{\circ}0\text{W}$. La Paz gives $P = +1\text{m}.45\text{s}$.

We may compare the intervals between these repetitions with multiples of 21min., as follows (adding that to follow on Sept. 16d.).

Even Date			Multiple	Observed			O - C
d.	h.	m.		h.	m.	s.	
13	12	19	0	12	19	10	+0.2
13	17	34	15	17	29	10	-4.8
14	1	37	38	1	43	0	+6.0
14	3	43	44	3	40	30	-2.5
16	11	43	204	11	48	0	-5.0

Sept. 14d. 6h. 17m. 30s.? Repetition from $18^{\circ}2\text{N}$. $68^{\circ}2\text{W}$. (as on 13d. 21h.).
 La Paz ($\Delta = 34^{\circ}7'$) $P = -7\text{m}.39\text{s}$., $L = +20^{\circ}5\text{m}$., $M = +23^{\circ}6\text{m}$. Uccle
 ($\Delta = 65^{\circ}0'$) $e(S) = -17\text{m}.0\text{s}$., $eL = +25^{\circ}5\text{m}$. De Bilt ($\Delta = 65^{\circ}6'$)
 $e = +17\text{m}.23\text{s}$., $ME = +32^{\circ}5\text{m}$., $MN = +35^{\circ}7\text{m}$. The interval 14d.
 6h. 17m. 30s. - 13d. 21h. 49m. 10s. = $24 \times 21\text{m}. + 4.3\text{m}$.

Sept. 14d. Records also at 4h. (Helwan), 6h. (Bidston and Rio Tinto), 8h. (Apia), 9h.56m. (near Edinburgh), 9h.58m. (close to De Bilt and apparently not same as former), 12h. (Dehra Dun), 13h. (Apia, Helwan, and Batavia), 14h. (near De Bilt), 15h. (Helwan), 16h. (Taihoku), 23h. (La Paz (2) and Rocca di Papa).

Sept. 15d. 17h. 30m. 55s. Epicentre $21^{\circ}0\text{N}$. $106^{\circ}5\text{W}$. (as on 1917 June 29d.).

$A = -.265$, $B = -.895$, $C = +.358$; $D = -.959$, $E = +.284$;
 $G = -.102$, $H = -.344$, $K = -.934$.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tucson	11.9	342	5 20	?S	(5 20)	+ 3	6.4	7.6
Berkeley	21.7	324	e 5 10	+ 9	—	—	—	—
Chicago	26.2	33	5 50	0	10 20	- 6	14.4	16.6
Victoria	30.6	338	15 25	?	16 24	?	18.2	19.8
Georgetown	30.9	48	6 29	- 8	17 2	?L	(17.0)	—
Washington	30.9	48	6 31	- 6	11 9	-41	20.9	17.6
Cheltenham(U.S.)	31.0	48	16 36	?L	—	—	19.9	20.3
Toronto	31.9	39	—	—	13 29	+82	e 17.9	21.6
Ithaca	33.0	44	—	—	—	—	i 18.3	—
Ottawa	35.1	39	i 8 19	+65	—	—	e 18.4	—
Honolulu	47.8	280	e 19 5	?SR ₁	—	—	21.9	27.1
La Paz	53.1	132	i 9 39	+12	19 1	+124	30.4	33.4
Edinburgh	79.9	34	—	—	—	—	43.1	47.6
Eskdalemuir	80.0	34	22 33	?S	(22 33)	+10	40.1	48.4
Bidston	80.8	38	30 17	?SR ₁	—	—	—	47.6
Coimbra	82.5	50	—	—	e 22 43	- 9	e 46.4	49.7
Oxford	82.6	39	—	—	—	—	—	48.6
Kew	83.2	39	—	—	—	—	—	49.1
Rio Tinto	84.7	52	43 5	?L	—	—	(43.1)	53.1
San Fernando	85.4	53	49 5	?L	—	—	(49.1)	53.1
De Bilt	85.9	35	—	—	23 35	+ 6	e 42.1	51.7
Paris	86.0	39	e 12 55	+ 2	e 23 19	-11	46.1	50.1
Uccle	86.1	37	e 12 53	- 1	e 23 23	- 8	e 41.1	50.1
Hamburg	87.7	31	—	—	—	—	e 47.1	58.8
Strasbourg	89.1	38	—	—	—	—	e 44.1	52.1
Moncalieri	91.0	40	e 18 23	?	i 25 19	+55	44.5	—
Rocca di Papa	95.8	40	e 13 2	-46	—	—	—	13.8
Helwan	114.9	40	—	—	30 5	+116	—	—

Additional records: Chicago $T_0 = 17\text{h}.31\text{m}.5\text{s}$. Victoria probably another shock.
 Georgetown $iPV = +6\text{m}.32\text{s}$., $SN = +17\text{m}.4\text{s}$., $SV = +17\text{m}.32\text{s}$.
 Washington $e = +18\text{m}.35\text{s}$.(=L?), $T_0 = 17\text{h}.31\text{m}.36\text{s}$. Cheltenham $LN = +18^{\circ}9\text{m}$., $MN = +19^{\circ}3\text{m}$. La Paz $T_0 = 17\text{h}.29\text{m}.11\text{s}$. Eskdalemuir
 $MN = +47^{\circ}4\text{m}$. Coimbra $SN = +34\text{m}.27\text{s}$.(=L?), $eLN = +47^{\circ}7\text{m}$., $MN = +49^{\circ}7\text{m}$.
 San Fernando $MN = +52^{\circ}1\text{m}$. De Bilt $MN = +50^{\circ}8\text{m}$.
 Paris $T_0 = 17\text{h}.31\text{m}.23\text{s}$. Uccle $T_0 = 17\text{h}.31\text{m}.18\text{s}$. Hamburg $MN = +53^{\circ}1\text{m}$.

Sept. 15d. Records also at 0h. (Apia and San Fernando), 2h. (Zurich and Tokyo (2)), 3h. (Honolulu), 4h. (Berkeley, Helwan, and De Bilt), 6h. (Mizusawa, Ootomari, Helwan, and Zurich), 7h.31m. (near Coimbra and Granada), 9h. (Apia), 11h. and 13h. (Helwan), 16h. (Denver), 17h. (Ann Arbor), 22h. (Helwan).

Sept. 16d. 2h. 18m. 37s. Epicentre $46^{\circ}4'N$, $10^{\circ}0'E$. (as on 1918 April 24d.).

$$A = +.679, B = +.120, C = +.724.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	M. m.
Chur	0.5	0 5	-3	0 11	-3	—
Zurich	1.4	e 0 22	+1	i 0 40	+1	0.8
Strasbourg	2.7	0 50	+8	e 1 9	-5	—

Additional records: Zurich ePN and ePV as ePE, iSV = +0m.42s., iMN = +0.7m. Strasbourg eV = +1m.28s.

Sept. 16d. 11h. 48m. 0s. Repetition from $15^{\circ}2'S$, $61^{\circ}0'W$. (as on Sept. 14d.).

$$A = +.468, B = -.844, C = -.262.$$

Uncertain, but the apparent uncertainty is increased by certain errors (such as that at Andalgala), which appear also on Sept. 13d. 12h.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
La Paz	7.0	258	i 1 45	- 1	—	—	3.0	3.2
Andalgala	E. 13.3	201	—	—	—	—	15.6	16.3
	N. 13.3	201	—	—	—	—	15.0	18.1
Pilar	E. 16.7	188	—	—	—	—	—	18.0
Mendoza	18.9	200	7 30	?S	(8 0)	0	8.0	12.9
Chicago	62.0	340	16 22	+357	20 53	+125	27.0	—
Bidston	84.5	31	47 6	?L	—	—	(47.1)	53.7
Paris	85.1	37	—	—	—	—	e 51.0	—
Uccle	87.1	36	—	—	—	—	—	52.0
Strasbourg	88.0	40	—	—	—	—	—	53.0
De Bilt	88.3	35	—	—	e 27 0	+185	e 51.0	54.1
Helwan	E. 99.5	62	52 0	?L	—	—	(52.0)	—
	N. 99.5	62	56 0	?L	—	—	(56.0)	—
Colombo	140.7	96	74 0	?L	—	—	(74.0)	—

Chicago gives L = +34.0m. and +42.0m.

De Bilt MN = +54.7m.

Sept. 16d. Records also at 0h. (Helwan), 9h. (Taihoku), 12h.37m.40s. (close to La Quiaca, which gives PE = +8s., L = +14s., M = +2.4m.), 15h.56m.0s. close to Osaka, which gives PS = +18s., L = +37s., M = +48s.), 16h. (Simla), 18h.33m.18s. (close to Osaka, which gives PS = +18s., L = +37s., MN = +53s.), 19h. (San Fernando), 21h. (Manila), 23h. (near Lick).

Sept. 17d. Records at 9h. (Helwan and Manila), 12h.30m. (close to Mizusawa), 13h.12m. (close to Mizusawa), 19h. (San Fernando).

Sept. 18d. Records at 5h. (Helwan), 7h. (Helwan), 11h. (Helwan), 12h. (Algiers and Lemberg), 14h. (Honolulu), 16h. (Helwan), 19h. (close to Lick (2)), 20h. (Taihoku and Zi-ka-wei), 21h. (Helwan and San Fernando). For note on Helwan records see introduction to this number of the Summary, p. 86.

Sept. 19d. 3h. 13m. 40s. Epicentre $59^{\circ}2'N$, $151^{\circ}0'W$. (as on 1919 Aug. 31d.).

$$A = -.448, B = -.248, C = +.859.$$

Very uncertain. It appears to be impossible to reconcile the records as they stand. The present solution assumed that La Paz is about 5m. in error.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Victoria	19.4	111	—	—	—	—	—	26.5
Berkeley	28.2	126	—	—	e 11 20	+17	—	—
Tucson	38.0	117	13 50	?S	(13 50)	+12	15.3	16.3
Chicago	42.0	85	8 39	+28	14 25	-10	19.6	—
Toronto	44.8	77	—	—	(15 2)	-10	17.7	—
Ottawa	45.1	73	—	—	e 15 20	0	e 26.3	—
La Paz	190.6	104	e 10 43	-210	e 20 38	-323	33.5	36.0

Toronto gives S as an L.

Sept. 19d. Records also at 0h. (Helwan), 2h. (Hamburg), 4h. (Helwan, Melbourne, Riverview, Adelaide, and La Paz), 5h. (close to Rocca di Papa, De Bilt, and Moncalieri), 5h.43m. (Helwan, Bidston, and Uccle), 6h. (Strasbourg and Paris), 8h. (La Paz, Helwan, Uccle, and De Bilt), 9h. (Manila), 11h. (La Paz), 12h.40m. (Vienna, Helwan, Hamburg, Bidston, De Bilt, and Uccle), 13h. (Uccle, Strasbourg, Eskdalemuir, and Kew), 15h. (Melbourne and Riverview), 16h. (Helwan), 17h. (Tortosa and Barcelona), 19h. (San Fernando), 20h. (Apia), 21h. (Taihoku), 22h. (Taihoku), 23h. (Tokyo).

Sept. 20d. 8h. 52m. 48s. Epicentre $44^{\circ}5'N$, $11^{\circ}5'E$. (as on 1918 Mar. 11d.).

$$A = +.699, B = +.142, C = +.701.$$

	Δ	P.	O - C.	S.	O - C.	L.	M.
		m. s.	s.	m. s.	s.	m.	m.
Florence	0.7	(0 0)	-11	—	—	—	(0.2)
Moncalieri	2.7	0 43	+ 1	1 16	+ 2	—	—
Rocca di Papa	2.8	e 0 37	- 7	—	—	—	1.3
Zurich	3.5	e 1 0	+ 5	i 2 3	+ 26	—	—
Vienna	5.0	e 1 54	+ 37	—	—	i 2.8	3.4

Florence records P at 8h.51m.48s. and M at 51m.58s., earlier than the adopted T_0 : these have been increased by 1m. for entry in the table. But even then they seem too early. Zurich gives ePN = +0m.54s., eP = +0m.56s., i = +1m.14s., iSN = +2m.5s.

Sept. 20d. Records also at 3h. (San Fernando), 4h. (Sydney), 10h. (Helwan), 11h. (Apia), 14h. (Colombo), 15h. (Manila).

Sept. 21d. Records at 0h. (San Fernando), 4h. (Manila, Batavia, and Zi-ka-wei), 6h. (La Paz), 10h. (De Bilt and Paris), 11h. (Strasbourg, Edinburgh, Uccle, and De Bilt), 12h. (Helwan), 14h. (La Paz), 16h. (Colombo), 20h. (Apia and Riverview), 21h. (Batavia and Helwan), 22h. (Manila), 23h. (Apia).

Sept. 22d. Records at 1h. (Manila), 5h. (Manila, Helwan, La Paz, and near Taihoku), 6h. (Manila and Zi-ka-wei), 7h. (San Fernando), 9h. (near Mizusawa), 11h. (Toronto, Victoria, and Apia), 12h. (Manila), 14h. (Apia), 18h. (near Tokyo), 22h. and 23h. (Manila).

Sept. 23d. 20h. 40m. 35s. Epicentre $48^{\circ}6'S$, $113^{\circ}3'W$.

$$A = -.262, B = -.608, C = -.750; \quad D = -.918, E = +.396; \\ G = +.297, H = +.689, K = -.661.$$

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Cipolletti	33.5	91	12 31	?S	(12 31)	-1	15.5	18.0
Mendoza	35.9	84	9 13	?	—	—	—	13.8
La Paz	48.7	68	8 58	0	16 2	0	23.7	24.8
Melbourne	69.3	236	—	—	—	—	e 34.4	37.9
Bidston	137.6	58	68 1	?L	—	—	(68.0)	73.6
Uccle	140.9	63	—	—	—	—	e 70.4	—
De Bilt	141.8	61	—	—	—	—	e 71.4	74.6
Helwan	147.3	112	74 25	?L	—	—	(74.4)	—

Additional records: De Bilt gives MN = +74.1m. Helwan PN = +75m.25s.

Sept. 23d. Records also at 0h. (Helwan), 1h. (La Paz), 2h. (Helwan), 3h. (Helwan and San Fernando), 8h., 10h. (2), 13h., and 14h. (near Manila), 15h. (Tokyo), 19h. (Taihoku), 20h. (Manila (2)), 21h. (La Paz).

Sept. 24d. Records at 2h. (Helwan), 4h. (San Fernando), 5h. (La Paz), 7h. (Apia), 10h. (Colombo), 11h. (Taihoku), 13h. (near Algiers), 14h. (La Paz), 15h. (Melbourne and near Lick), 18h. (La Paz), 19h. (Lick and Manila).

Sept. 25d. Records at 1h. (Algiers), 3h. (San Fernando), 4h. (La Paz), 10h. (Helwan), 15h. (near Tortosa), 16h. (La Paz (2), Helwan, Rocca di Papa, and near Vieques), 17h. (Coimbra, Port-au-Prince, La Paz, Mendoza, Pilar, and Andalgala, evidently from some origin in South America, but the records do not give a determination), 20h. (Rocca di Papa), 22h. (San Fernando).

Sept. 26d. 6h. 25m. 34s. Epicentre 22°·5N. 116°·5E.

$$A = -\cdot412, B = +\cdot827, C = +\cdot383.$$

	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Hokoto	3·0	71	0 23	-24	—	—	0·9	—
Taihoku	5·4	57	1 25	+ 2	—	—	2·0	2·2
Manila	9·0	151	—	—	e 4 4	+ 1	—	—
Zi-ka-wei	9·8	26	—	—	e 4 20	- 3	—	—

Sept. 26d. 7h. 20m. (30s.). An anticipation of the shock at 9h. from Epicentre 17°·3N. 120°·5E.?. Osaka gives P = +5m.15s., ME = +14·6m., MN = +15·5m., Tokyo gives P = +7m.54s., S = +9m.27s. (one or other of which may be S), and L = +10·8m. Mizusawa PE = +8m.30s., PN = +9m.0s. (?S). Helwan P = +30m.30s. (?SR₁).

1919. Sept. 26d. 9h. 6m. 50s. Epicentre 17°·3N. 120°·5E.
(as on 1919 June 24d.).

$$A = -\cdot485, B = +\cdot823, C = +\cdot297; D = +\cdot862, E = +\cdot508; \\ G = -\cdot151, H = +\cdot256, K = -\cdot955.$$

	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	2·8	170	e 0 44	0	—	—	—	—
Hokoto	6·3	352	0 12	?	—	—	—	—
Taihoku	7·8	7	1 57	- 1	4 52	+81	8·8	9·5
Zi-ka-wei	14·0	3	e 3 20	- 6	e 6 10	+ 2	—	11·3
Kobe	21·8	34	4 59	- 4	—	—	8·7	9·5
Osaka	21·9	35	4 56	- 8	—	—	9·1	11·6
Tokyo	25·1	39	5 36	- 3	8 44	-81	10·7	—
Batavia	27·1	211	5 46	-13	—	—	—	11·8
Mizusawa	E. 28·3	36	5 56	-15	10 41	-23	—	—
N. 28·3	36	5 52	-19	10 38	-26	—	—	—
Calcutta	30·7	286	6 10	-25	—	—	—	—
Ootomari	34·7	27	6 46	-25	—	—	—	—
Colombo	41·0	261	10 10	?	—	—	13·4	13·9
Simla	41·6	298	13 52	?	(13 52)	-37	—	26·3
Kodaikanal	42·8	268	8 34	+17	—	—	23·4	26·0
Riverview	58·9	150	—	—	e 18 16	+ 6	—	30·5
Honolulu	76·1	73	21 58	?S	(21 58)	+20	31·7	49·2
Helwan	80·8	299	20 10	?	—	—	—	—
Budapest	84·8	318	i 12 53	+ 6	—	—	—	—
Vienna	86·2	320	12 44	-10	23 17	-15	40·2	55·2
Hamburg	87·7	327	i 12 50	-13	e 23 22	-27	e 45·2	57·2
Pola	89·1	317	26 16	?	—	—	49·1	53·2
Pompeii	90·3	313	13 3	-15	23 40	-37	—	—
De Bilt	91·0	326	—	—	23 44	-40	e 45·2	51·8
Rocca di Papa	91·2	315	13 6	-16	e 24 4	-22	e 55·2	62·0
Strasbourg	91·3	322	13 3	-20	—	—	e 47·2	51·6
Florence	91·3	317	23 39	?S	(23 39)	-48	43·2	50·2
Uccle	92·1	325	e 13 10	-18	e 22 4	-152	e 46·2	51·2
Moncalieri	93·0	319	13 14	-18	23 44	-61	38·0?	55·4
Eskdalemuir	93·3	332	24 2	?S	(24 2)	-46	48·2	54·4
Kew	94·1	329	27 10	?	—	—	—	57·2
Paris	94·2	325	i 17 10	?PR ₁	—	—	50·2	62·2
Bidston	94·4	330	24 47	?S	(24 47)	-13	—	54·6
Oxford	94·6	328	—	—	—	—	—	57·9
Algiers	100·1	314	—	—	—	—	59·2	62·7
Coimbra	105·5	322	e 25 48	?S	(25 48)	-59	54·4	—
Rio Tinto	105·9	319	—	—	26 10	-41	—	64·2
San Fernando	106·4	320	58 10	?L	—	—	61·2	64·2
Chicago	115·5	23	19 36	?PR ₁	29 6	?	e 43·2	—
Ottawa	115·7	13	i 19 30	?PR ₁	—	—	e 59·2	—
Toronto	116·7	16	21 34	?	—	—	30·3	—
Washington	121·3	16	20 20	?PR ₁	—	—	—	—
Georgetown	121·3	16	19 51	?PR ₁	—	—	—	—
La Paz	171·6	86	20 19	[+ 3] i 29 41	?	?	—	—

Manila assigns epicentre adopted. Zi-ka-wei gives MN = +13·8m., T₀ = 9h.6m.40s. Kobe MN = +8·9m. Osaka MN = +10·3m. Batavia MN = +10·9m. Calcutta PN = +6m.16s. Riverview MN = +25·9m. Vienna PR₁ = +16m.8s. Hamburg MN = +49·6m., T₀ = 9h.7m.6s. De Bilt eLN = +44·2m., MN = +51·5m. Uccle MN = +51·0m. Moncalieri MN = +53s., T₀ = 9h.7m.31s. Bidston S = +32m.34s. Coimbra ePN = +27m.48s., L = +56·1m. San Fernando (Milne) P = +61m.10s., L = +65·2m., MN = +67·7m. Both instruments MN = +67·7m. Chicago L = +65·3m. Ottawa L = +69·2m. Toronto L = +33·9m.?. Georgetown records have been diminished by 1h., eN = +20m.29s.

1919. Sept. 26d. 19h. 39m. 20s. Epicentre $6^{\circ}3'N$. $123^{\circ}2'E$.

(as given by Manila and De Bilt).

A = -0.544, B = +0.832, C = +0.110; D = +0.837, E = +0.548;

G = -0.060, H = +0.092, K = -0.994.

The epicentre of 1917 Nov. 16d. 22h., viz., $6^{\circ}0'N$. $125^{\circ}0'E$., was first tried, and the residuals indicated a change to $7^{\circ}2'N$. $124^{\circ}0'E$., i.e., in the direction of the Manila epicentre in both co-ordinates, though not by the appropriate amounts. The Manila epicentre was therefore adopted. The La Paz and Coimbra records suggest that the focus is higher than normal, but on trial the stations near the epicentre did not support this hypothesis.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	8.6	346	e 2 40	+30	—	—	—	—
Taihoku	18.8	355	4 40	+13	8 8	+10	10.6	—
Batavia	20.6	233	i 5 6	+18	9 11	+35	e 13.3	22.8
Zi-ka-wei	25.0	356	e 4 34	-64	e 9 58	-5	—	16.0
Kobe	30.5	21	6 47	+14	—	—	14.1	16.7
Osaka	30.6	21	6 1	-33	11 13	-31	15.6	19.6
Mizusawa	E. 36.5	25	7 15	-11	12 46	-31	—	—
N. 36.5	25	7 19	-7	12 52	-25	—	—	—
Calcutta	37.3	300	7 46	+14	—	—	—	—
Perth	38.9	189	—	—	13 15	-36	19.8	—
Colombo	43.0	273	8 34	+16	10 34	?PR ₁	14.4	31.7
Adelaide	43.8	161	8 34	+10	15 4	+5	21.3	29.0
Kodaikanal	45.5	278	10 22	+105	—	—	15.1	35.1
Riverview	48.1	148	e 8 54	-1	e 15 58	+3	e 23.1	29.8
Sydney	48.1	148	8 58	+3	15 58	-3	23.1	30.4
Melbourne	48.5	157	8 58	+1	16 10	+10	21.7	22.0
Simla	49.7	309	16 22	?S	(16 22)	-7	—	32.8
Bombay	50.1	290	9 23	+15	—	—	—	—
Apia	67.6	107	e 11 28	+26	e 20 40	+43	38.7	—
Honolulu	77.3	70	12 40	+37	—	—	e 36.8	52.1
Helwan	88.4	300	13 40	+33	—	—	—	68.4
Budapest	94.7	320	e 12 23	-79	—	—	—	—
Vienna	96.3	321	17 21	?PR ₁	—	—	e 35.7	58.7
Hamburg	98.2	326	18 4	?PR ₁	—	—	e 44.7	55.7
Victoria	100.4	38	—	—	(25 30)	-30	25.5	34.4
Rocca di Papa	100.8	314	e 14 15	+1	—	—	e 52.5	62.7
Florence	101.2	317	—	—	22 10	?	—	36.7
Strasbourg	101.5	321	—	—	e 25 40	-30	e 50.7	63.4
De Bilt	101.6	325	—	—	e 24 57	-74	50.7	61.7
Uccle	102.6	325	—	—	33 5	?SR ₁	46.7	66.8
Paris	104.5	323	e 14 31	-1	e 25 10	-88	51.7	57.7
Kew	104.8	328	43 40	?L	—	—	(43.7)	69.7
Berkeley	104.9	48	—	—	e 38 40	?	—	—
Oxford	105.2	328	—	—	—	—	e 52.2	60.7
Lick	105.6	48	—	—	—	—	e 48.7	—
Algiers	109.5	311	—	—	—	—	e 31.7	81.7
Moncalieri	103.0	318	13 48	-37	24 57	-87	38.0	70.9
Capetown	105.7	235	25 4	?S	(25 4)	-105	—	—
Coimbra	115.9	320	18 56	[+15]	29 53	+96	e 43.6	—
San Fernando	116.2	315	—	—	33 40	?	73.7	79.7
Chicago	124.3	27	21 8	?PR ₁	30 50	?	86.7	—
Washington	131.0	19	e 21 30	?PR ₁	—	—	—	—
La Paz	165.0	134	20 30	[+18]	35 33	?	77.2	84.1

Esksdalemuir ($\Delta = 114^{\circ}2$) gives simply 20h.20m. to 21h.50m. Ottawa ($\Delta = 125^{\circ}6$) gives eL = 20h.36m. to 42m., L = 20h.47m. to 55m., L = 21h.0m. to 5m., L = 21h.7m. to 16m., L = 21h.20m. to 25m. Toronto ($\Delta = 126^{\circ}0$) gives L = 21h.0m.12s., 21h.7m.48s., eL = 21h.10m.0s., M = 20h.11m.24s., L = 20h.25m.36s.

Additional records: Batavia MP = +7m.37s., S - iP = 3m.42s. (from which S above has been inferred), MS = +9m.11s., T₀ = 19h.39m.19s. Zi-ka-wei MN = +16.4m. Perth PR = +10m.11s., SR = +16m.34s. Adelaide PR = +10m.16s., SR = +13m.4s. Riverview SR₁ = +19m.41s., MN = +30.2m., MZ = +31.7m., T₀ = 19h.39m.14s. Melbourne SR₁ = +19m.22s. Apia gives e₁ (taken as P) e₂ (taken as S), and e₃ = +32m.40s. Helwan PN = +17m.16s., MN = +65.6m. Uccle PR₁ = +24m.52s. = S? MN = +58.9m. De Bilt e(SR₁) = +33m.3s., eLN = +48.7m., MN = +58.0m. Moncalieri MN = +62.1m., T₀ = 19h.39m.54s. San Fernando MN = +84.7m.

The following appear to be repetitions from the same epicentre. The intervals from the first shock are 1h.58.7m. = 3×21 m. - 7.3m. and 3h.9.0m. = 9×21 .0m. exactly.

Sept. 26d. 21h. 38m. 0s. Epicentre $6^{\circ}3'N$. $123^{\circ}2'E$. (as at 19h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	8.6	346	e 3 36	?S	(e 3 36)	-17	—	—
Taihoku	18.8	355	8 2	?S	(8 2)	+ 4	—	—
Batavia	20.6	233	e 5 1	+13	9 5	+29	e 12.0	—
Zi-ka-wei	25.0	356	e 5 40	+ 2	e 10 2	- 1	—	—
Osaka	30.6	21	6 37	+ 3	—	—	—	11.6
Colombo	43.0	273	—	—	14 0	-48	—	32.0
Kodaikanal	45.5	278	17 54	?SR ₁	—	—	—	—
Riverview	48.1	148	—	—	e 15 54	- 1	e 26.3	38.7
Strasbourg	101.5	321	—	—	—	—	64.0	—
De Bilt	101.6	325	—	—	—	—	e 55.0	64.3
Uccle	102.6	325	—	—	—	—	—	59.0
Moncalieri	112.6	318	—	—	31 26	?	65.2	—

Additional records: Batavia gives $T_0 = 21$ h.37m.55s. Zi-ka-wei gives $T_0 = 21$ h.38m.10s. Osaka MN = +16.9m. Kodaikanal gives also P - +29m.12s. (?L). Riverview eSR₁ = -19m.31s., MN = +43.2m. Strasbourg +57m.0s. De Bilt eLN = +53.0m., MN = +58.1m.

Sept. 26d. 22h. 48m. 20s. Further repetition from $6^{\circ}3'N$. $123^{\circ}2'E$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	8.6	346	e 2 52	-42	—	—	—	—
Taihoku	18.8	355	7 59	?S	(7 59)	+ 1	—	—
Batavia	20.6	233	e 4 58	+10	8 54	+18	e 13.7	—
Zi-ka-wei	25.0	356	e 5 31	- 7	e 9 54	- 9	—	—
Osaka	30.6	21	5 58	-36	—	—	—	17.4
Riverview	48.1	148	—	—	e 15 44	-11	—	36.5
Pompeii	99.8	312	55 37	?L	—	—	(55.6)	—
Rocca di Papa	100.8	314	e 55 3	?L	—	—	(55.1)	56.9
Strasbourg	101.5	321	58 40	?L	—	—	(58.7)	—
De Bilt	101.6	325	—	—	—	—	55.7	65.5
Uccle	102.6	325	—	—	—	—	e 57.7	—
Moncalieri	112.6	318	—	—	—	—	e 64.9	—

Additional records: Batavia gives $T_0 = 22$ h.48m.23s. Osaka MN = +16.9m. Riverview eSR₁ = +19m.16s., MN = +34.5m. Zi-ka-wei $T_0 = 22$ h.48m.20s. The records at Pompeii and Rocca di Papa may belong to a local shock. De Bilt eLN = +53.7m., MN = +58.2m.

Sept. 26d. Additional record at 1h. (Bidston), 8h. (Riverview), 10h. and 11h. (Manila).

Sept. 27d. 3h. 33m. 50s. Epicentre $7^{\circ}0'N$. $82^{\circ}5'W$.

A = +.130, B = -.984, C = +.122; D = -.991, E = -.131;
G = +.016, H = -.121, K = -.992.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Hts. E.	3.5	55	1 30	+35	—	—	2.8	3.1
N.	3.5	55	1 34	+39	—	—	2.8	3.1
La Paz	27.4	149	6 5	+ 3	10 45	- 3	14.2	17.0
Washington	32.3	8	e 6 5	-46	—	—	—	—
Georgetown	32.3	8	—	—	—	—	e 18.2	—
Chicago	35.1	353	7 27	+13	11 50	-67	e 16.2	—
Ann Arbor	35.3	359	—	—	—	—	26.2	—
Toronto	36.7	4	i 17 28	?L	—	—	19.0	23.9
Ottawa	38.8	7	8 6	+22	e 13 58	- 9	e 21.2	—
Honolulu	74.1	291	—	—	—	—	36.2	41.5
Uccle	82.6	40	e 23 22	?S	(23 22)	+29	e 40.2	—
De Bilt	83.0	40	e 23 52	?S	(23 52)	+55	e 41.2	44.9
Helwan	106.8	56	35 10	?SR ₁	—	—	—	—

Additional records: La Paz gives $T_0 = 3$ h.34m.2s. Georgetown gives eLE? = +14m.51s. -SR₁?. Chicago gives $T_0 = 3$ h.34m.30s. Toronto gives another eL at +20.0m. Ottawa gives PR₁ = +9m.46s., LE = +26.2m., L = +46.2m., $T_0 = 3$ h.34m.32s. De Bilt eLN = +39.2m.

Sept. 27d. Records also at 0h. (Manila), 1h. (Helwan), 5h. (Rocca di Papa), 6h. (Batavia and Manila), 7h. (Helwan), 8h. (Paris), 9h. (Helwan), 10h.56m.20s. (Batavia $P = +3m.23s.$, $S = +6m.5s.$, $M = +7.3m.$ Manila $P = +6m.0s.$, Taihoku, Chicago $P = +17m.10s.$, $S = +25m.38s.$), 11h.30m.? (Cheltenham, Washington, Georgetown, and Ithaca), 12h. (Rocca di Papa), 18h. (La Paz), 19h. (Moncalieri), 22h. (Apia), 23h. (Apia and Kodaikanal).

Sept. 28d. Records at 0h. (Taihoku (2)), 1h.39m. (close to Taihoku), 4h.39m. (close to Mizusawa, recorded also at Tokyo), 7h.33m. (close to Mizusawa, recorded also at Osaka), 8h. (San Fernando), 11h. (Manila), 17h. (near Tokyo), 19h.18m. (close to Taihoku), 19h. (San Fernando).

Sept. 29d. 13h. 41m. 20s. Epicentre $25^{\circ}0'N$, $123^{\circ}0'E$. (as on 1918 Mar. 27d.).

$A = -.494$, $B = +.760$, $C = +.423$; $D = +.839$, $E = +.545$;

$G = -.230$, $H = +.354$, $K = -.906$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.3	274	0 17	- 3	—	—	0.4	0.8
Hokoto	3.5	245	0 25	-30	—	—	1.0	—
Zi-ka-wei	6.3	348	e 1 27	- 9	e 2 59	+ 7	—	4.3
Manila	10.6	191	2 33	- 5	—	—	—	—
Osaka	14.5	45	6 10	?S	(6 10)	-10	10.0	13.0
Tokyo	17.9	50	3 34	-42	10 23	?L	13.8	—

Additional records: Zi-ka-wei gives $MN = +3.7m.$ Osaka gives $MN = 12.4m.$ Mizusawa ($\Delta = 20^{\circ}8'$) gives $EN = +18m.40s.$, $E = +19m.16s.$; both records probably belong to some other shock.

Sept. 29d. Records also at 4h. (Athens (2)), 12h. (Helwan, Vienna, Apia, and Honolulu), 13h. (Manila, Apia, Honolulu, and Paris), 14h. (Bidston, De Bilt, and Uccle), 18h. (Taihoku and Zi-ka-wei), 19h. (Mizusawa and Tokyo), 21h. (Ootomari), 22h. (San Fernando).

Sept. 30d. 7h. 37m. 8s. Epicentre $28^{\circ}0'N$, $112^{\circ}5'W$.

$A = -.338$, $B = -.816$, $C = +.469$; $D = -.924$, $E = +.383$;

$G = -.180$, $H = -.434$, $K = -.883$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tucson	4.5	19	1 20	+10	—	—	2.0	2.8
Lick	12.1	323	e 3 56	+56	—	—	—	—
Berkeley	12.9	323	e 3 3	- 9	—	—	—	5.7
Chicago	24.5	49	5 27	- 6	9 50	- 4	12.7	—
Toronto	30.8	51	8 44	+128	—	—	10.7	12.2
Honolulu	41.7	271	—	—	—	—	19.4	22.4

Additional records: Berkeley $MN = +6.6m.$ Toronto $L = +16.4m.$, which may belong to following shock.

Sept. 30d. 7h. 52m. 32s. Epicentre $38^{\circ}0'N$, $82^{\circ}5'W$.

$A = +.103$, $B = -.781$, $C = +.616$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Washington	4.3	76	—	—	e 1 58	0	3.1	—
Cheltenham	E. 4.4	78	1 14	+ 6	—	—	5.1	6.6
	N. 4.4	78	1 10	+ 2	(2 8)	+ 7	2.1	2.2
Ithaca	6.3	43	e 2 43	+67	e 3 20	+28	—	—
Northfield	9.6	49	—	—	e 4 28	+10	—	—
Point Loma	28.7	268	7 28	?PR ₁	—	—	—	—

This epicentre is 27° from the last, and an L wave would just about reach it in the interval.

Sept. 30d. Records also at 1h. (Batavia and Manila), 2h. (Helwan), 4h. (Helwan), 9h. (Apia, Helwan), 10h. (Tokyo), 14h. (Tokyo), 15h. (Apia, Helwan, and Riverview), 16h. (Apia), 17h. (Helwan and Uccle), 19h.54m. (close to Tokyo), 23h. (Lick).

TABLE.

De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.
1	15	28	13	51	553	991	438	101	855	1565	710
2	31	55	24	52	560	1004	444	102	860	1575	715
3	47	83	36	53	566	1016	450	103	865	1584	719
4	62	110	48	54	573	1029	456	104	870	1593	723
5	77	137	60	55	579	1041	462	105	874	1602	728
6	92	164	72	56	586	1054	468	106	879	1612	733
7	106	190	84	57	592	1066	474	107	884	1621	737
8	121	217	96	58	599	1079	480	108	888	1630	742
9	136	243	107	59	605	1091	486	109	893	1639	746
10	150	269	119	60	612	1103	491	110	897	1648	751
11	164	294	130	61	619	1116	497	111	902	1657	755
12	179	319	140	62	625	1128	503	112	907	1666	759
13	193	344	151	63	632	1141	509	113	911	1674	763
14	206	368	162	64	638	1153	515	114	916	1682	766
15	219	392	173	65	645	1165	520	115	920	1690	770
16	232	415	183	66	651	1177	526	116	925	1698	773
17	245	438	193	67	658	1190	532	117	929	1706	777
18	257	460	203	68	664	1202	538	118	934	1714	780
19	269	482	213	69	671	1214	543	119	938	1722	784
20	281	503	222	70	677	1226	549	120	942	1729	787
21	293	524	231	71	683	1238	555	121	947	1737	790
22	305	545	240	72	690	1250	560	122	952	1744	792
23	317	565	248	73	696	1262	566	123	957	1752	795
24	328	584	256	74	702	1274	572	124	961	1759	798
25	338	603	265	75	709	1286	577	125	966	1766	800
26	348	622	274	76	715	1297	582	126	970	1773	803
27	358	641	283	77	721	1309	588	127	974	1780	806
28	368	659	291	78	727	1320	593	128	978	1787	809
29	378	677	299	79	733	1332	599	129	983	1794	811
30	388	694	306	80	739	1343	604	130	988	1801	813
31	398	711	313	81	745	1355	610	131	992	1807	815
32	407	728	321	82	750	1366	616	132	996	1814	818
33	416	744	328	83	756	1377	621	133	1001	1821	820
34	425	760	335	84	762	1388	626	134	1005	1827	822
35	433	775	342	85	768	1399	631	135	1009	1833	824
36	442	790	348	86	773	1410	637	136	1014	1840	826
37	450	804	354	87	779	1421	642	137	1018	1846	828
38	458	818	360	88	785	1432	647	138	1023	1852	829
39	466	832	366	89	790	1443	653	139	1027	1858	831
40	475	847	372	90	796	1454	658	140	1031	1864	833
41	483	861	378	91	801	1464	663	141	1035	1869	834
42	491	875	384	92	807	1475	668	142	1039	1875	836
43	498	888	390	93	812	1485	673	143	1043	1881	838
44	506	902	396	94	818	1496	678	144	1047	1886	839
45	513	915	402	95	823	1506	683	145	1051	1892	841
46	520	928	408	96	829	1516	687	146	1055	1897	842
47	527	941	414	97	834	1526	692	147	1059	1902	843
48	534	954	420	98	840	1536	696	148	1063	1907	844
49	540	966	426	99	845	1546	701	149	1067	1912	845
50	547	979	432	100	851	1556	705	150	1071	1917	846

The International Seismological Summary for 1919 October, November, December.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number concludes the second year of the Summary in its new official form.

Attention may be called to the cases of suspected exceptional focal depth on

Oct. 12d. 21h. 48m. 15s. Epicentre (given in the note at end) $20^{\circ}\text{S. } 102^{\circ}\cdot 5\text{E.}$; depth $0\cdot 020$ *above* normal.

Oct. 27d. 3h. 40m. 48s. Epicentre $16^{\circ}\cdot 0\text{S. } 69^{\circ}\cdot 5\text{W.}$; depth $0\cdot 040$ *below* normal.

Nov. 6d. 7h. 13m. 10s. Epicentre $13^{\circ}\cdot 5\text{N. } 59^{\circ}\cdot 0\text{W.}$; depth $0\cdot 010$ *below* normal.

Nov. 20d. 14h. 11m. 38s. Epicentre $13^{\circ}\cdot 0\text{S. } 166^{\circ}\cdot 8\text{E.}$; depth $0\cdot 040$ *below* normal, supported by similar observations on 1918 Dec. 14d.

The further discussion of the Italian Earthquakes for 1895—1914 has led to a new view of the 21 minute periodicity, so surprising that details are reserved until full confirmation is obtained. If this is realised in time something more may be said on the last pages of this number of the Summary.

H. H. TURNER.

University Observatory, Oxford.

1924 May 29.

1919 OCTOBER, NOVEMBER, DECEMBER.

Oct. 1d. 19h. 31m. 2s. Epicentre $33^{\circ}\cdot6\text{N}$. $116^{\circ}\cdot4\text{W}$. (as on 1918 Dec. 23d.).

A = $-\cdot370$, B = $-\cdot746$, C = $+\cdot553$; D = $-\cdot896$, E = $+\cdot445$;

G = $-\cdot246$, H = $-\cdot496$, K = $-\cdot833$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tucson	E.	4.8	104	1 14	0	(2 10)	- 1	2.2	2.9
Berkeley	N.	6.4	313	—	—	—	—	e 5.0	6.1
Denver		11.0	53	—	—	—	—	5.5	6.0
Victoria		15.7	343	9 23	?L	—	—	(9.4)	11.5
Chicago		24.0	62	—	—	—	—	e 13.1	14.0
Georgetown		31.9	69	—	—	—	—	e 17.4	—
Washington		31.9	69	—	—	e 17 10	?L	18.2	—
Ottawa		33.1	57	—	—	—	—	i 18.2	—
Azores		70.6	57	28 4	?SR ₁	—	—	—	—
De Bilt		80.3	32	—	—	—	—	e 44.0	—

Additional records: Berkeley gives eE = $+\cdot5\text{m.4s.}$, eV = $+\cdot5\text{m.7s.}$ George-town eN = $+\cdot16\text{m.58s.}$

Oct. 1d. Records also at 7h. (Rio Tinto), 11h. (Melbourne), 16h. (Helwan and near La Paz), 17h. (Kingston), 18h. and 21h. (Tucson).

Oct. 2d. Records at 1h., 3h., 9h., and 10h. (La Paz), 20h. (Taihoku), 23h. (Batavia).

1919. Oct. 3d. 9h. 37m. 20s. Epicentre $16^{\circ}\cdot5\text{S}$. $180^{\circ}\cdot0$

(Suggested by Apia).

A = $-\cdot959$, B = $\cdot000$, C = $-\cdot284$; D = $\cdot000$, E = $+\cdot1\cdot000$;

G = $+\cdot284$, H = $\cdot000$, K = $-\cdot959$.

Station and Component.	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia	8.4	73	2 3	- 4	3 39	- 8	4.1	—
Riverview	31.2	230	e 6 20	-20	i 11 29	-25	e 13.2	17.6
Sydney	31.2	230	7 10	+30	11 28	-26	14.2	17.4
Melbourne	37.4	229	—	—	13 28	- 2	19.2	21.7
Adelaide	41.3	236	—	—	—	—	—	25.0
Honolulu	43.5	31	i 13 58	?S	(i 13 58)	-57	e 22.9	29.2
Perth	59.7	242	13 52	—	20 19	+120	32.4	—
Tokyo	64.6	325	—	—	—	—	e 30.9	—
Manila	66.1	295	e 12 2	+70	—	—	—	—
Taihoku	70.5	307	—	—	—	—	30.8	—
Batavia	72.1	270	e 11 3	-28	—	—	e 38.0	40.8
Zi-ka-wei	73.7	312	e 11 56	-16	e 21 26	-16	—	—
Berkeley	76.7	44	—	—	—	—	e 33.7	—
Lick	76.9	45	—	—	—	—	e 36.8	—
Victoria	82.1	35	23 9	?S	(23 9)	-22	41.4	50.2
Colombo	101.6	273	36 40	?	—	—	—	67.7
Chicago	102.6	50	24 48	?S	(24 48)	-92	52.7	—
Kodaikanal	104.8	277	60 4	?	—	—	63.2	64.0
Ann Arbor	E. 105.6	50	—	—	—	—	—	62.7
Toronto	108.9	48	—	—	35 16	?SR ₁	e 56.3	62.4
Georgetown	E. 110.1	54	—	—	e 30 13	+164	56.9	—
Washington	110.1	54	—	—	e 52 40	?	55.2	—
Ithaca	E. 110.9	50	—	—	—	—	59.7	—
Ottawa	E. 111.7	47	—	—	e 29 10	+87	e 53.7	—
Mauritius	E. 112.4	240	34 52	?SR ₁	—	—	—	57.2
Capetown	126.9	200	76 16	?L	—	—	(76.3)	—
Edinburgh	140.5	2	40 50	?SR ₁	—	—	68.7	88.4
Eskdalemuir	141.1	2	e 24 17	?PR ₁	e 31 7	- 3	58.7	72.7
Hamburg	142.1	350	—	—	e 22 40	?PR ₁	e 67.7	83.8

Continued on next page.

Station and Component.	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Bidston	143.0	2	45 46	?	51 40	?	—	77.0
De Bilt	E. 144.2	354	—	—	e 41 34	?SR ₁	e 67.7	77.0
	N. 144.2	354	—	—	e 42 28	?SR ₁	—	74.6
Uccle	145.5	356	e 19 46	[- 3]	—	—	e 47.7	77.8
Vienna	145.5	340	19 48	[- 1]	—	—	e 53.7	90.7
Strasbourg	147.3	349	—	—	e 22 40	?PR ₁	e 47.7	86.2
Paris	147.6	357	e 19 53	[+ 1]	e 32 10	?	63.7	—
Helwan	E. 148.4	299	27 4	?	—	—	—	128.1
	N. 148.4	299	29 10	?	—	—	—	122.5
Pola	149.3	340	—	—	—	—	e 79.7	90.5
Moncalieri	150.8	349	35 6	?	51 40	?	70.9	95.0
Florence	151.1	343	43 6	?SR ₁	—	—	64.0	79.7
Rocca di Papa	152.5	339	19 22	[- 37]	—	—	e 81.2	—
Coimbra	155.2	16	e 40 20	?SR ₁	e 48 40	?	61.7	81.2
San Fernando	E. 159.3	14	83 52	?L	—	—	87.7	91.7
Algiers	159.5	353	—	—	—	—	89.7	98.7

Additional records and notes: Riverview PS = +11m.49s., MN = +15.3m., MZ = +17.0m., T₀ = 9h.37m.10s. Melbourne gives PR₁ = +8m.46s., SR₂ = +16m.43s. Honolulu records iS as iP and gives iS = +17m.10s. Perth PR₁ = +17m.3s., SR₁ = +25m.52s., SR₂ = +18m.25s. This record is given at 8h. Victoria records S as P and gives S? = +36m.31s. Chicago PR₁ = +27m.18s., S = +32m.46s., L = +47.7m. Toronto L = +42.3m., +45.8m., and +54.9m. Georgetown eLN = +53.1m. Ottawa iE = +35m.20s. and many L's. Eskdalemuir e = +41m.7s. Hamburg MN = +81.3m. De Bilt eE = +25m.40s. Uccle MN = +79.3m. Moncalieri MN = +87.3m. Coimbra LN = +66.7m. San Fernando PE = +84m.40s.

Oct. 3d. Records also at 7h. (Rio Tinto), 11h. (Toronto), 12h. (near Tokyo), 20h. (Zi-ka-wei and near Taihoku), 21h. (Taihoku).

Oct. 4d. 17h. 50m. 0s. Epicentre 2° 0'N. 83° 0'E.

A = +.122, B = +.992, C = +.035; D = +.993, E = -.122;
G = +.004, H = +.035, K = -.999.

The origin is very uncertain.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Colombo	5.8	327	1 30	0	(2 30)	- 9	2.5	4.0
Kodaikanal	9.9	326	—	—	—	—	5.2	7.7
Bombay	19.6	330	4 33	- 3	—	—	—	—
Batavia	25.2	109	4 41	- 59	—	—	—	9.1
Simla	29.6	350	e 9 36	?S	(e 9 36)	-111	—	15.0
Manila	39.5	70	e 7 0	-51	—	—	—	—
Zi-ka-wei	46.5	49	e 10 30	?PR ₁	—	—	—	—
Helwan	E. 56.3	308	22 24	?SR ₁	—	—	—	36.9
	N. 56.3	308	17 36	?S	(17 36)	- 2	—	31.6
Riverview	73.2	128	—	—	e 20 12	—	e 32.4	35.7
Sydney	73.2	128	33 30	?L	—	—	(33.5)	41.0
Hamburg	78.4	325	—	—	—	—	e 48.0	51.0
De Bilt	E. 81.0	323	—	—	e 36 18	?	e 49.0	53.2
	N. 81.0	323	—	—	e 22 36	+ 1	e 42.0	46.4
Uccle	81.3	322	—	—	—	—	e 38.0	44.0
Eskdalemuir	86.2	326	—	—	—	—	42.0	—
San Fernando	88.2	309	36 0	?L	—	—	(36.0)	—

Riverview gives MN = +34.6m.

Oct. 4d. Records also at 1h. (San Fernando), 2h. (near Tortosa), 3h. (Barcelona), 4h. (San Fernando), 5h. (Florence), 6h. (Kodaikanal), 8h. (Azores), 10h. (Apia, La Paz, and Batavia), 11h. (Riverview), 12h. (Florence), 13h. and 14h. (Helwan), 19h. (Kodaikanal, Batavia, Zi-ka-wei, and Colombo), 22h. (Athens and near Rocca di Papa).

Oct. 5d. Records at 0h. (San Fernando), 1h. (Batavia, Colombo, and near Athens), 2h. (Helwan, La Paz, Chicago, and near Lick and Berkeley), 10h. (Apia), 13h. (Helwan), 21h. (San Fernando).

Oct. 6d. Records at 0h. (San Fernando), 2h. (Honolulu), 8h. (Mauritius), 10h. (Rocca di Papa).

Oct. 7d. 9h. 13m. 0s. Epicentre $44^{\circ}0'N$. $20^{\circ}0'E$. (as on 1918 Aug. 4d.). $A = +.676$, $B = +.246$, $C = +.695$.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Pola	4.4	e 1 0	- 8	—	—	e 1.4	1.6
Vienna	4.9	e 2 48	?S	(e 2 48)	+34	—	3.2
Pompeii	5.2	e 1 46	+26	2 16	- 6	—	—
Rocca di Papa	5.8	e 1 8	—	2 14	-25	—	2.4
Zurich	E. 8.7	e 2 16	+ 4	3 53	- 3	—	—
N. 8.7	e 2 17	+ 5	3 53	- 3	—	—	—

Oct. 7d. Records also at 3h. (Riverview (3)), 10h. (close to Rocca di Papa and Pompeii), 23h. (close to Nagasaki).

1919. Oct. 8d. 4h. 40m. 30s. Epicentre $0^{\circ}0'145^{\circ}0'E$.

(as on 1918 Sept. 2d.).

 $A = -.819$, $B = +.574$, $C = .000$; $D = +.574$, $E = +.819$; $G = .000$, $H = .000$, $K = -.1000$.Zi-ka-wei assigns epicentre $0^{\circ}2'S$. $144^{\circ}2'E$. The material seems scarcely good enough to decide the locality with great accuracy.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	27.9	303	e 6 6	- 1	10 52	- 5	13.4	15.7
Taihoku	33.8	320	—	—	12 36	- 2	17.6	19.7
Riverview	34.3	171	e 6 15	-52	e 11 2	-102	13.6	19.7
Sydney	34.3	171	11 0	?S	13 30	+46	16.6	17.7
Adelaide	35.5	189	5 18	-120	—	—	15.8	18.3
Osaka	35.8	347	7 30	+10	—	—	—	16.2
Tokyo	36.0	354	e 5 47	-95	11 27	-103	17.8	—
Melbourne	37.8	180	12 0	?S	16 24	?SR ₁	18.2	21.7
Zi-ka-wei	38.3	327	e 7 44	+ 4	e 13 45	+ 3	—	—
Batavia	38.6	260	e 8 47	+64	—	—	—	9.1
Perth	42.2	218	7 31	-41	13 36	-62	21.4	22.6
Honolulu	59.5	65	e 9 48	-21	18 0	-17	e 28.9	41.5
Colombo	65.4	277	23 30	?SR ₁	—	—	—	—
Simla	71.2	305	e 21 12	?S	(21 12)	+32	—	—
Victoria	91.2	42	24 23	?S	(24 23)	- 3	43.1	54.9
Berkeley	92.1	52	—	—	—	—	e 42.5	—
Helwan	110.4	302	26 30	?S	(26 30)	-62	—	—
Vienna	114.5	326	—	—	—	—	55.9	—
Hamburg	114.9	332	—	—	—	—	e 58.5	68.5
Chicago	116.9	40	—	—	29 18	+53	56.5	—
De Bilt	118.0	333	—	—	23 6	?	e 56.5	74.0
Edinburgh	118.5	340	—	—	—	—	53.5	74.9
Eskdalemuir	118.9	340	34 8	?	41 21	?	50.0	—
Strasbourg	119.0	329	—	—	e 28 30	-12	58.5	74.3
Uccle	119.3	333	—	—	e 30 18	+94	e 58.5	73.5
Florence	119.9	322	30 43	?S	(30 43)	+115	58.5	61.9
Rocca di Papa	120.1	320	i 22 43	?PR ₁	—	—	e 63.2	72.9
Bidston	120.4	339	58 42	?L	63 48	?	(58.7)	68.5
Kew	120.8	336	—	—	—	—	—	78.5
Oxford	120.9	335	—	—	—	—	e 55.9	76.9
Toronto	121.1	36	—	—	i 50 12	?	e 63.3	78.1
Moncalieri	121.3	326	e 21 6	?PR ₁	31 39	+160	40.7	—
Paris	121.5	332	e 23 24	?PR ₁	e 37 38	?SR ₁	59.5	74.5
Ottawa	122.1	33	—	—	—	—	59.5	—
Tortosa	128.0	325	22 30	?PR ₁	—	—	59.5	77.5
Algiers	129.1	320	e 22 37	?PR ₁	—	—	76.5	81.5
Coimbra	133.1	331	44 19	?SR ₁	57 20	?	69.5	82.3
San Fernando	134.8	327	76 30	?L	—	—	(76.5)	93.5
La Paz	143.4	120	e 19 51	[+ 5]	32 51	?	68.5	77.1

Additional records and notes: Manila gives MN = +14.0m., T₀ = 4h.40m.36s.
 Riverview MN = +18.9m., MZ = +18.7m. Adelaide SR₁ = +13m.0s.
 Osaka MN = +18.3m. Melbourne SR₁ = +17m.0s. Helwan PN =
 +36m.30s. Chicago L = +61.5m. and +72.5m. De Bilt e = +30m.6s.,
 MN = +65.0m. Strasbourg MN = +71.0m. Uccle MN = +68.9m.
 Rocca di Papa eL = +71.6m. Toronto eL = +71.5m., L = +107.1m.
 and +134.6m. Coimbra ePN = -45m.19s., MN = +77.4m.

Oct. 8d. 22h. 35m. 20s. Epicentre $17^{\circ}5'N$. $47^{\circ}5'W$.

$$A = +.644, B = -.703, C = +.301; \quad D = -.737, E = -.676; \\ G = +.203, H = -.222, K = -.954.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz	39.6	212	i 7 51	0	i 14 4	+ 4	20.4	23.0
Coimbra	40.6	49	—	—	e 13 30	-45	18.1	20.1
Chicago	41.9	315	14 35	?S	(14 35)	+ 1	20.8	—
Paris	51.0	41	i 9 9	- 4	e 16 22	- 9	23.7	—
Uccle	52.7	40	e 9 22	- 2	e 16 28	-24	e 23.7	—
Moncalieri	53.3	46	—	—	i 17 4	- 4	24.8	—
De Bilt	53.6	39	—	—	e 17 7	- 3	e 23.7	25.4
Rocca di Papa	56.4	51	e 9 48	0	—	—	—	10.1
Helwan	71.9	61	38 40	?L	—	—	(38.7)	—

Additional records: Chicago records S as P and gives S? = -18m.5s. Moncalieri records S as i and gives S = +21m.1s. De Bilt MN = +36.9m. Helwan PN = +40m.40s.

Oct. 8d. Records also at 2h. (Riverview), 3h. (near Lick), 5h. (near Manila), 6h. (Perth), 7h. (Barcelona), 9h. (Helwan, Riverview, De Bilt, and Paris), 13h. (Apia and Helwan), 14h. (Colombo), 15h. (Helwan), 16h. (Rocca di Papa).

Oct. 9d. 6h. 51m. 20s. Epicentre $3^{\circ}5'S$. $102^{\circ}5'E$. (as on 1919 Jan. 18d.).

$$A = -.216, B = +.975, C = -.061; \quad D = +.976, E = +.216, \\ G = +.013, H = -.060, K = -.998.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Batavia	5.1	123	1 21	+ 2	2 21	+ 1	—	6.2
Colombo	24.9	294	10 40	?S	(10 40)	+39	—	18.7
Manila	25.7	45	e 10 40	?S	(e 10 40)	+24	—	—
Kodaikanal	28.5	299	—	—	—	—	14.8	18.4
Taihoku	34.0	33	19 40	?L	—	—	(19.7)	—
Zi-ka-wei	39.1	26	e 7 42	- 5	—	—	—	—
Simla	42.2	327	e 25 28	?L	—	—	(e 25.5)	—
Adelaide	45.9	138	19 22	?SR ₁	23 10	?L	26.1	28.2
Melbourne	51.8	137	—	—	—	e 26.7	31.2	—
Riverview	54.5	130	—	—	—	e 29.3	—	—
Helwan	75.5	302	26 40	?SR ₁	(22 40)	+68	—	—
De Bilt	97.3	322	—	—	—	e 61.7	—	—
Paris	99.2	319	—	—	—	59.7	—	—
La Paz	158.0	204	20 49	[+43]	—	—	61.7	63.1

Additional records: Batavia gives $T_0 = 6h.51m.8s.$, $4^{\circ}0'S$. $101^{\circ}1'E$. Adelaide $PR_1 = +21m.4s.$, $SR_1 = +24m.58s.$

Oct. 9d. 17h. 7m. 23s. (i) { Epicentre $41^{\circ}0'N$. $24^{\circ}6'E$. (as on 1919 Aug. 22d.).
21h. 38m. 18s. (ii) }

$$A = +.686, B = +.314, C = +.656; \quad D = +.416, E = -.909; \\ G = +.596, H = +.273, K = -.755.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
(i) Athens	3.2	192	e 0 48	- 2	e 1 30	+ 2	e 1.6	2.0
(ii) Athens	3.2	192	0 51	+ 1	1 28	0	e 1.6	2.2
(i) Rocca di Papa	9.0	279	(e 1 25)	-51	e 1 25	?P	e 4.8	8.2
(ii) Rocca di Papa	9.0	279	—	—	e 4 0	- 3	—	4.6
(i) Helwan	12.4	152	4 7	?	—	—	—	—
(ii) Helwan	12.4	152	3 42	+37	—	—	(6.7)	—
(i) Moncalieri	12.9	293	—	—	e 8 30	?L	10.7	—
(ii) Moncalieri	12.9	293	e 4 36	+84	7 5	?L	9.7	—
(i) Strasbourg	14.1	308	—	—	—	—	10.6	—
(ii) Strasbourg	14.1	308	e 4 22	+55	—	—	e 9.7	—
(i) Uccle	17.1	312	—	—	—	—	e 11.6	—
(ii) Uccle	17.1	312	e 4 0	- 6	e 8 6	+46	(e 8.1)	—
(i) De Bilt	17.3	317	—	—	—	—	e 12.6	—
(ii) De Bilt	17.3	317	—	—	—	—	e 11.9	—

Additional records: Rocca di Papa iPE = 17h.6m.24s., iPN = 17h.6m.36s., M = 17h.6m.48s. Helwan PE = 17h.3m. Strasbourg +17m.37s. Uccle (ii) gives L as S and records L = 10.7m., $T_0 = 21h.37m.12s.$

Oct. 9d. Records also at 1h. (near Batavia), 7h. and 8h. (near Athens), 9h. (Batavia, near Balboa Heights and near Athens (3)), 10h. (Rocca di Papa), 11h. (La Paz), 13h. (Helwan and Athens), 16h. (Florence, Batavia, and Paris).

1919. Oct. 10d. 1h. 7m. 20s. Epicentre 49°0N. 124°0W.

(as on 1918 Dec. 6d.).

A = -·367, B = -·544, C = +·755; D = -·829, E = +·559;
G = -·422, H = -·626, K = -·656.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria		0·8	141	0 41	+29	—	—	1·7	2·2
Berkeley	E.	11·2	173	e 2 56	+ 9	(5 3)	+ 4	5·0	6·9
	N.	11·2	173	e 2 42	- 5	(4 48)	-11	4·8	11·1
	Z.	11·2	173	e 2 50	+ 3	(4 39)	-20	4·6	—
Lick		12·1	171	c 2 48	-12	—	—	—	—
Denver		16·4	117	—	—	—	—	7·7	—
Chicago		26·3	92	5 20	-31	10 18	-10	16·4	—
Ann Arbor		28·6	88	—	—	12 22	+72	18·0	19·7
		28·6	88	—	—	12 28	+78	18·1	19·7
Toronto		30·8	82	—	—	—	—	e 18·6	20·7
Ottawa		32·5	78	8 0	?PR ₁	12 10	- 6	e 17·5	—
Ithaca		33·2	82	—	—	—	—	19·8	—
Georgetown		34·7	89	e 6 58	-13	—	—	21·1	—
	Z.	34·7	89	e 7 3	- 8	—	—	23·2	—
Cheltenham	E.	34·9	89	8 40	?PR ₁	—	—	21·5	26·5
	N.	34·9	89	12 25	?S	(12 25)	-29	20·8	21·8
Honolulu		38·6	236	—	—	—	—	11·0	19·7
Edinburgh		64·1	33	—	—	19 58	+44	31·7	40·5
Bidston		66·1	35	31 22	?L	35 10	?	(31·4)	41·5
Tokyo		67·5	299	27 50	?SR ₁	34 19	?L	(34·3)	—
Oxford		68·1	35	—	—	20 41	+38	31·6	44·5
Kew		68·7	35	—	—	—	—	—	41·7
De Bilt	E.	70·1	29	—	—	20 44	+17	e 30·7	36·2
Hamburg		70·4	27	—	—	—	—	e 31·7	—
Osaka		70·7	301	29 14	?L	—	—	(29·2)	36·4
Uccle		70·9	31	—	—	21 16	+39	e 31·7	35·7
Paris		71·9	34	e 11 33	+4	—	—	33·7	36·7
Strasbourg		74·0	30	—	—	—	—	e 32·7	37·7
Vienna		76·9	26	12 5	+ 5	—	—	e 35·7	—
Moncalieri		77·0	32	e 22 15	?S	(e 22 15)	+26	40·8	—
San Fernando	E.	78·4	47	46 40	?L	—	—	(46·7)	48·2
Florence		79·3	30	22 33	?S	(22 33)	+18	34·7	36·7
Zi-ka-wei		80·9	310	—	—	e 22 46	+12	—	—
Rocca di Papa		81·6	30	i 12 46	+18	24 1	+79	e 48·0	54·1
La Paz		82·1	129	11 52	-39	22 54	+ 7	54·7	56·2
Taihoku		86·4	305	34 40	?L	—	—	(34·7)	—
Simla		97·7	341	e 46 4	?L	—	—	(e 46·1)	55·5
Helwan		98·1	20	62 40	?L	—	—	(62·7)	—
Riverview		111·8	244	—	—	—	—	e 49·4	62·5
Kodaikanal		117·9	337	62 58	?L	—	—	(63·0)	—
Melbourne		118·2	245	—	—	—	—	e 60·7	62·7
Adelaide		120·1	250	—	—	55 58	?L	62·6	66·2

Additional records: Ann Arbor gives MN = +19·9m. and +19·2m., LN = +18·2m. Toronto IL = +20·1m. Ottawa L = +21·7m., 22·7m., and +67·7m.. T₀ = 1h.10m.7s. De Bilt eLN = +31·7m., MN = +36·8m. Moncalieri S = +32m.12s. Osaka MN = +39·2m. San Fernando MN = +43·7m. Helwan P₁N = +66m.10s. Adelaide SR₁ = +58m.10s.

Oct. 10d. Records also at 2h. (Tucson), 3h. (Batavia), 6h. and 8h. (La Paz), 9h. (La Paz and Zi-ka-wei), 18h. (Taihoku), 20h. (Apia and La Paz), 21h. (Taihoku), 23h. (De Bilt, Edinburgh, and near Mizusawa).

Oct. 11d. 13h. 17m. 25s. Epicentre $41^{\circ}0'N$. $139^{\circ}0'E$.

A = -570, B = +195, C = +656; D = -656, E = +755;
G = -495, H = +430, K = -755.

	Δ °	Az. °	P. m. s.	O-C. s.	s. m. s.	O-C. s.	L. m.	M. m.
Mizusawa E.	2.5	139	0 43	- 4	1 12	+ 3	—	—
Tokyo	5.3	174	1 48	+26	2 48	+23	—	—
Ootomari	6.2	24	1 33	- 2	(2 9)	-10	2.2	3.1
Zi-ka-wei	17.2	241	e 3 17	-50	—	—	—	—
Taihoku	21.6	228	8 35	?S	(8 35)	-22	—	—
Colombo	62.4	254	40 35	?L	—	—	(40.6)	—
Hamburg	75.8	332	e 11 57	+ 3	c 21 43	+ 8	e 43.1	47.6
Vienna	77.4	325	12 9	+ 6	22 6	+13	e 45.6	50.1
Edinburgh	78.0	339	22 5	?S	(22 5)	+ 5	37.6	45.9
Eskdalemuir	78.5	339	22 9	?S	(22 9)	+ 3	31.6	—
De Bilt	78.7	333	—	—	c 22 14	- 6	e 39.6	46.9
Uccle	80.0	333	—	—	c 22 29	+ 6	e 38.6	50.8
Bidston	80.1	337	33 17	!	46 11	?L	(46.2)	55.1
Strasbourg	80.7	329	—	—	22 32	+ 1	42.4	49.2
Kew	81.0	336	—	—	—	—	—	50.6
Oxford	81.0	336	—	—	22 33	- 2	—	48.8
Pola	81.1	325	e 23 9	?S	(e 23 9)	+33	e 46.8	53.0
Paris	82.4	333	i 12 32	0	c 22 51	+ 1	43.6	46.6
Helwan	82.7	305	—	—	22 35	-19	—	—
Moncalieri	83.6	329	—	—	c 22 44	-21	43.7	50.8
Rocca di Papa	84.1	323	c 12 23	-20	23 5	- 4	e 47.4	54.6
Coimbra	93.6	338	45 55	?L	52 35	?	(45.9)	60.9
Rio Tinto	95.2	334	52 35	?L	—	—	(52.6)	60.6
San Fernando E.	96.3	332	57 5	?L	—	—	(57.5)	61.6
N.	96.3	332	55 5	?L	—	—	63.1	64.6

Additional records: Mizusawa gives $SN = +1m.9s$. Hamburg $i = +22m.13s$.
 $T_0 = 13h.17m.34s$. De Bilt $eN = +22m.28s$, $iE = +22m.42s$, $MN = +49.9m$.
 Strasbourg $MN = -52.7m$. Helwan $PN = +21m.35s$.
 Moncalieri $MN = +51.5m$. Rocca di Papa $iP = +12m.36s$. Coimbra $L = +59.4m$.

Oct. 11d. Records also at 4h. (Colombo), 6h. (Helwan), 9h. (near Batavia), 14h. and 15h. (2) (Rio Tinto), 19h. (near Osaka), 22h. (Lick).

1919. Oct. 12d. 21h. 48m. 15s. Epicentre $4^{\circ}0'S$. $101^{\circ}0'E$.

A = -190, B = +979, C = -070; D = +982, E = +191;
G = +013, H = -069, K = -998.

But see note at end.

	Δ °	Az. °	P. m. s.	O-C. s.	s. m. s.	O-C. s.	L. m.	M. m.
Batavia	6.2	111	i 1 34	- 1	2 42	- 7	—	3.7
Colombo	23.7	297	(5 45)	+20	5 45	?P	11.8	12.8
Manila	27.2	46	e 5 59	- 1	9 51	-54	11.4	12.8
Kodaikanal	27.4	301	6 15	+13	(10 57)	+ 9	11.0	18.8
Calcutta E.	29.3	336	5 57	-24	(10 57)	-25	11.0	—
N.	29.3	336	5 51	-30	(10 51)	-31	10.8	—
Perth	31.2	154	10 55	?S	(10 55)	-59	(15.4)	—
Taihoku	35.1	35	5 45	-89	—	—	—	—
Bombay	36.0	311	7 30	+ 8	13 13	+ 3	—	23.6
Zi-ka-wei	40.2	28	e 7 45	-12	c 13 51	-19	—	25.1
Simla	41.8	329	8 15	+ 6	15 39	+67	22.6	25.8
Mauritius N.	44.9	244	14 3	?S	(14 3)	-71	21.0	23.0
E.	44.9	244	13 45	?	(14 51)	-23	14.8	22.0
Adelaide	46.5	138	15 10	?S	(15 10)	-25	25.6	29.8
Osaka	50.5	38	9 7	- 3	16 21	- 4	24.9	34.8
Melbourne	52.4	138	9 45	+23	16 45	- 4	28.6	32.8
Riverview	55.3	130	2 52	?	7 21	?	e 24.8	31.4
Sydney	55.3	130	9 45	+ 4	17 33	+ 8	27.6	36.0
Mizusawa E.	56.8	38	9 52	+ 1	17 41	- 3	—	—
Ootomari	62.6	31	e 10 41	+12	—	—	—	—
Helwan E.	74.6	303	12 21	+35	—	—	—	46.8
N.	74.6	303	13 21	+95	—	—	—	46.2
Cape Town	81.5	236	22 21	?S	(22 21)	-20	51.8	55.4

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	\circ	\circ	m. s.	s.	m. s.	s.	m.	m.
Athens	82.5	310	e 12 50	+17	23 35	+43	e 48.0	51.5
Vienna	89.4	320	i 14 16	+64	i 24 17	+10	e 39.0	64.0
Pompeii	89.9	311	13 38	+23	24 28	+15	—	—
Pola	90.8	316	e 13 28	+8	e 23 48	-34	e 37.8	60.2
Rocca di Papa	91.4	312	13 16	-7	24 26	-2	e 68.0	—
Hamburg	93.8	323	i 13 45	+8	e 24 18	-36	e 47.8	53.8
Zurich	94.6	318	e 13 42	+1	—	—	—	—
Moncalieri	95.2	315	5 59	?	24 52	-16	41.2	62.8
Strasbourg	95.2	319	e 12 45	-59	e 24 45	-23	e 54.8	61.6
De Bilt	96.7	322	—	—	e 25 22	-1	e 49.8	64.4
Uccle	97.3	321	e 17 45	?PR ₁	(e 24 15)	-74	—	63.6
Paris	98.6	319	e 14 7	+4	25 0	-42	53.8	61.8
Kew	100.1	321	—	—	—	—	—	70.8
Tortosa	100.5	311	14 45	+32	25 55	-6	43.0	62.7
Oxford	100.8	321	17 11	?PR ₁	27 34	+91	33.0	65.5
Edinburgh	101.2	326	18 33	?PR ₁	27 37	+90	42.8	66.0
Eskdalemuir	101.3	326	19 45	?PR ₁	—	—	—	—
Bidston	101.5	322	27 9	?S	(27 9)	+59	—	63.8
San Fernando	106.2	309	66 45	?L	—	—	73.8	83.8
Rio Tinto	106.3	310	59 45	?L	—	—	(59.8)	77.8
Coimbra	107.4	311	e 18 25	?PR ₁	28 48	+103	44.2	—
Victoria	121.7	33	—	—	—	—	81.6	83.0
Ottawa	138.5	355	—	—	i 22 40	?PR ₁	e 66.8	—
Toronto	140.4	0	—	—	—	—	82.0	86.4
Ann Arbor	141.5	5	—	—	—	—	71.8	—
Chicago	141.5	10	i 22 50	?PR ₁	32 10	?	65.8	—
Ithaca	141.5	356	22 57	?PR ₁	—	—	e 85.0	—
Georgetown	145.1	356	e 19 59	[+11]	23 19	?PR ₁	—	—
La Paz	156.8	207	e 20 19	[+14]	34 41	?	73.0	79.4

Additional records: Manila gives MN = +12.9m., T₀ = 21h.49m.24s. Zi-ka-wei MN = +26.6m., T₀ = 21h.48m.18s. Adelaide PR₁ = +16m.45s. Osaka MN = +37.4m., T₀ = 21h.48m.17s. Riverview MN = +33.4m., T₀ = 21h.50m.10s. There appears to be some error here. Mizusawa SN = +17m.39s., T₀ = 21h.48m.45s. Hamburg MN = +49.8m., T₀ = 21h.49m.25s. Moncalieri MN = 62.2m. De Bilt ePR₁E = +17m.45s., eE = 24m.13s., MN = +61.0m. Uccle MN = +64.6m. Bidston records S as P and gives S = +35m.21s. San Fernando MN = +75.2m. Coimbra PN = +19m.23s. Ottawa iE = +23m.31s., LE = +76.8m. Chicago L = +71.8m. +86.8m. +107.8m. and +123.8m. La Paz iP = +20m.24s.

NOTE TO 1919 OCT. 12d. 21h.

The above solution is about the best that can be given for normal depth of focus. But the Georgetown and La Paz residuals suggest a high focus. If we adopt 0.020 as the focal height and 2.0S 102.5E. (which was deduced by computation from a preliminary trial with 1.0S. 104.5E.), the principal stations within 90° of the epicentre show errors in Δ as follow:—

	Az.	Δ	Corr. for	Δ	O-C.
		observed	Height	calculated	\circ
Zi-ka-wei	27	38.9	+1.7	37.8	-0.6
Ootomari	30	64.4	+2.4	60.2	+1.8
Osaka	37	50.1	+2.0	48.0	+0.1
Mizusawa	37	56.8	+2.3	54.3	+0.2
Manila	47	27.1	+1.1	24.7	+1.3
Taihoku	33	25.7	+1.5	32.8	-8.6
Sydney	131	55.9	+2.3	55.5	-1.9
Batavia	134	6.0	0.0	6.1	-0.1
Melbourne	138	52.1	+2.2	52.8	-2.9
Adelaide	139	44.6	+2.0	47.0	-4.4
Perth	159	27.8	+1.5	32.5	-6.2
Colombo	292	25.7	+1.1	24.3	+0.3
Kodaikanal	297	28.3	+1.3	27.8	-0.8
Bombay	309	36.6	+1.6	35.9	-0.9
Simla	325	44.6	+1.7	41.0	+1.9
Calcutta	331	27.2	+1.3	28.1	-2.2
Helwan	301	80.4	+2.6	74.8	+3.0

It appears that an epicentre slightly further south would suit the Australian and Japanese records. The Indian stations, however, do not seem susceptible of further improvement.

Oct. 12d. Records also at 5h. and 10h. (La Paz), 12h. (Helwan and near Taihoku), 17h. (Zi-ka-wei), 18h. (Helwan, Paris, and De Bilt), 21h. (near Athens, Pompeii, and Rocca di Papa), 23h. (Victoria).

Oct. 13d. 7h. 54m. 10s. Epicentre $41^{\circ}5'N$. $28^{\circ}0'E$. (as on 1918 Feb. 9d.).

A = +.661, B = +.352, C = +.662; D = +.470, E = -.883;

G = +.585, H = +.311, K = -.749.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	E.	4.9	224	e 1 8	- 8	—	—	4.8	5.3
	N.	4.9	224	—	—	—	—	4.6	5.0
Pompeii		10.2	271	2 33	0	—	—	—	—
Vienna		10.6	313	2 51	+13	—	—	—	11.1
Rocca di Papa		11.4	276	e 2 57	+ 7	—	—	—	3.9
Helwan		12.0	166	3 50	+51	—	—	—	—
Moncalieri		15.1	290	4 44	+64	e 8 29	?L	11.2	12.8
Strasbourg		15.9	303	e 2 50	-61	e 8 10	?L	(8.2)	—
Hamburg		17.1	321	—	—	—	—	e 8.8	12.8
Uccle		18.7	308	—	—	—	—	—	13.8
De Bilt		18.8	312	—	—	—	—	e 10.8	17.3
Paris		19.3	301	—	—	—	—	e 5.8	—

Additional records: Moncalieri gives MN = +12.4m., T_0 = 7h.54m.13s.
Strasbourg e = +11m.56s. De Bilt MN = +13.8m.

Oct. 13d. 13h. 4m. 10s. Epicentre $41^{\circ}5'N$. $28^{\circ}0'E$. (as at 7h.).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Athens		4.9	224	i 0 49	-27	—	—	i 0.9	1.0
Pompeii		10.2	271	2 33	0	9 3	?L	(9.0)	—
Vienna		10.6	313	3 22	+44	—	—	i 7.1	8.8
Rocca di Papa		11.4	276	2 51	+ 1	—	—	—	7.0
Helwan		12.0	166	7 50	?L	—	—	(7.8)	—
Moncalieri		15.1	290	e 5 2	+82	7 1	+27	10.0	—
Hamburg		17.1	321	—	—	—	—	e 9.8	15.4
Uccle		18.7	308	—	—	—	—	e 9.8	—
De Bilt		18.8	312	—	—	—	—	11.3	11.6
Paris		19.3	301	—	—	—	—	e 9.8	—

Additional records: Rocca di Papa gives MN = +5.2m. Helwan PN = +9m.50s. Hamburg MN = +13.2m. De Bilt MN = +11.7m.

Oct. 13d. Records also at 5h. (Batavia and Manila), 6h. (Helwan), 13h. (near Athens), 14h. (near Athens (4)), 15h. (Helwan and near Athens), 16h. (Taihoku), 17h. and 18h. (near Athens), 20h. (San Fernando and Lick), 21h. (near Athens), 22h. (near Lick).

Oct. 14d. 16h. 55m. 40s. Epicentre $11^{\circ}0'N$. $88^{\circ}0'W$.

A = +.034, B = -.982, C = +.191; D = -.999, E = -.035;

G = +.007, H = -.190, K = -.982.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Vieques	E.	23.0	67	—	—	—	—	7.6	9.9
Cheltenham	E.	29.4	18	6 18	- 4	(11 20)	- 4	11.3	21.8
	N.	29.4	18	6 21	- 1	(11 30)	+ 6	11.5	13.5
Chicago		30.8	0	6 28	- 8	(11 20)	-28	11.3	—
La Paz		33.8	144	34 37	?	—	—	—	—
Ottawa		35.9	16	—	—	—	—	e 17.3	—
San Fernando		77.0	55	32 20	?L	—	—	(32.3)	—
Bidston		78.2	38	37 50	?L	—	—	(37.8)	42.1
De Bilt	E.	83.3	39	—	—	—	—	e 38.3	44.8
	N.	83.3	39	—	—	e 37 20	?	e 42.3	43.2
Hamburg		85.9	37	—	—	—	—	e 46.3	—
Helwan		108.9	52	58 20	?L	—	—	(58.4)	—

Additional records: Chicago gives $S?$ = +9m.32s. Bidston gives its record as at 16h. Helwan PN = +71m.20s.

Oct. 14d. Records also at 0h. (San Fernando), 3h. (near Rocca di Papa), 6h. near Mizusawa and Tokyo), 8h. (near Tokyo), 9h. (Florence), 11h. (Apia and Riverview), 12h. (Colombo, Victoria, Helwan, and Chicago), 19h. (near Athens).

Oct. 15d. 15h. 45m. 40s. Epicentre $23^{\circ}3'N$, $122^{\circ}0'E$.

$A = -.487$, $B = +.779$, $C = +.396$; $D = +.848$, $E = +.530$;

$G = -.209$, $H = +.335$, $K = -.918$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.8	345	0 29	+ 1	—	—	0.8	—
Hokoto	2.3	276	0 36	0	—	—	1.0	2.0
Zi-ka-wei	7.9	356	1 58	- 2	e 3 30	- 4	—	4.3
Manila	8.8	186	e 2 32	- 19	—	—	—	—
Helwan	79.2	298	53 20	?L	—	—	(53.3)	—
Hamburg	83.5	326	e 43 20	?L	—	—	e 51.3	53.3
De Bilt	86.7	326	—	—	—	—	e 46.3	55.2
Strasbourg	87.4	322	—	—	—	—	—	55.3
Uccle	87.8	325	—	—	—	—	e 43.3	57.3
Edinburgh	88.3	331	55 20	?L	—	—	(55.3)	56.8
Paris	90.0	324	—	—	—	—	53.3	—

Additional records: Zi-ka-wei gives $MN = +4.7m.$, $T_0 = 15h.45m.45s.$ Helwan
 $PN = +52m.20s.$ (?L). De Bilt $MN = +56.5m.$

Oct. 15d. Records also at 0h. (San Fernando), 2h. (La Paz), 8h. (Rio Tinto and Florence), 9h. (Azores), 12h. (Nagasaki), 22h. (near Taihoku), 23h. (near Athens).

Oct. 16d. Records at 1h. (Florence), 5h. (near La Paz), 19h. (Helwan and Taihoku), 21h. (Manila).

Oct. 17d. Records at 3h. (near Tokyo), 5h. (Florence), 8h. (San Fernando), 14h. (La Paz), 17h. (Apia and Tokyo), 22h. (Batavia).

Oct. 18d. Records at 4h. (Taihoku), 6h. (Manila), 10h. (near Athens), 13h. and 14h. (La Paz), 15h. (Simla and near Lick and Berkeley), 18h. (near Lick and Berkeley), 19h. (shock in Southern Europe recorded at Rocca di Papa, Tortosa, San Fernando, Barcelona, Strasbourg, and Paris, but the records do not seem to admit of a formal determination).

Oct. 19d. 1h. 32m. 28s. Epicentre $16^{\circ}5'S$, $180^{\circ}0'$ (as on Oct. 3d.).

$A = -.959$, $B = .000$, $C = -.284$; $D = .000$, $E = +1.000$;

$G = +.284$, $H = .000$, $K = -.959$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Sydney	31.2	230	11 32	?S	(11 32)	- 22	14.0	16.0
Riverview	31.2	230	e 7 26	+ 46	e 12 9	+ 15	e 13.9	14.7
Melbourne	37.4	229	13 32	?S	(13 32)	+ 2	e 17.5	20.0
Adelaide	41.3	236	8 8	+ 3	14 20	- 5	19.8	23.1
De Bilt	E. 144.2	354	—	—	e 36 14	?	e 84.5	91.3
	N. 144.2	354	—	—	—	—	e 53.0	91.4
Uccle	145.5	356	—	—	—	—	e 78.5	91.5
Paris	147.6	357	—	—	—	—	e 88.5	—
Helwan	148.4	299	55 32	?	—	—	(90.5)	—
Rocca di Papa	152.5	339	—	—	—	—	e 94.8	—

Riverview gives $MN = +15.0m.$ Adelaide $PR_1 = +10m.8s.$

Oct. 19d. Records also at 5h. (Batavia and Colombo), 6h. and 10h. (Helwan), 12h. (Manila), 21h. (San Fernando), 22h. (near Athens (2)).

Oct. 20d. Records at 1h. (Florence), 5h. (Batavia), 12h. (Apia), 13h. (Melbourne), 14h. (Perth and near Athens), 15h. (Berkeley), 21h. (San Fernando)

Oct. 21d. 0h. 24m. 50s. Epicentre $41^{\circ}1'N$. $14^{\circ}0'E$. (as on 1918 Mar. 22d.).

A = +.732, B = +.183, C = +.656.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Pompeii	0.4	-0 2	- 8	—	—	—	0.3
Rocca di Papa	1.3	0 15	- 5	0 57	+19	(1.0)	1.0
Florence	3.5	-0 22	-77	—	—	—	—
Moncalieri	6.1	1 56	+23	3 24	+38	4.8	—
Vienna	7.4	1 30	-22	—	—	2.8	3.6
Zurich	7.4	e 1 31	-21	i 3 24	+ 3	—	4.4
Athens	8.1	e 1 26	-37	(e 3 46)	+ 6	e 3.8	—
Strasbourg	8.8	e 2 38	+25	4 23	+25	(4.4)	5.2
Paris	11.3	—	—	e 4 35	-27	e 6.1	8.2
Uccle	11.9	—	—	e 5 10	- 7	e 6.7	—
De Bilt	12.6	—	—	—	—	e 6.8	8.9
Hamburg	12.9	—	—	—	—	e 6.3	9.2

Additional records: Vienna gives PNZ = +1m.27s. Zurich eN = +1m.40s.,
 MN = +4.6m. De Bilt MN = +8.5m.

Oct. 21d. 5h. 41m. 45s. Epicentre $26^{\circ}0'S$. $38^{\circ}0'E$. (as on 1915 May 8d.).

A = +.708, B = +.553, C = -.438; D = +.616, E = -.788;
 G = -.345, H = -.270, K = -.899.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan	56.4	353	34 15	?L	—	—	(34.2)	—
Rocca di Papa	71.6	340	—	—	—	—	e 49.6	53.6
Strasbourg	79.3	341	—	—	—	—	58.2	—
Paris	80.4	337	—	—	—	—	e 52.2	—
Uccle	82.3	340	—	—	e 22 39	-10	e 42.2	49.2
De Bilt	83.2	341	—	—	e 23 5	+ 6	e 49.2	53.8
Hamburg	83.2	345	—	—	e 27 22	?SR ₁	—	34.2

Additional records: De Bilt gives MN = +54.6m. Hamburg e = +30m.45s.,
 MZ = +33.4m.

Oct. 21d. 21h. 21m. 0s. Epicentre $7^{\circ}0'S$. $148^{\circ}0'E$. (as on 1913 Oct. 11d.).

A = -.842, B = +.526, C = -.122; D = +.530, E = +.848;
 G = +.103, H = -.065, K = -.992.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Sydney	27.0	174	11 24	?S	(11 24)	+43	14.8	17.4
Riverview	27.0	174	—	—	i 11 30	+49	e 15.1	16.7
Adelaide	29.3	196	—	—	—	—	19.3	20.8
Melbourne	30.9	185	12 0	?S	(12 0)	+10	22.7	24.0
Manila	34.4	309	e 7 42	+34	—	—	—	—
Batavia	40.9	269	e 8 0	- 2	—	—	—	—
Taihoku	41.1	322	—	—	—	—	e 18.0	—
Zi-ka-wei	45.9	328	e 8 54	+15	—	—	—	—
Honolulu	60.1	60	18 18	?S	(18 18)	- 6	28.4	38.5
Mauritius	87.7	250	45 6	?L	—	—	(45.1)	48.2
Victoria	94.4	42	—	—	—	—	48.2	54.2
Helwan	116.5	299	30 0	?S	(30 0)	+98	(55.0)	—
Chicago	119.9	45	—	—	—	—	e 60.0	—
Toronto	124.8	40	—	—	—	—	e 71.9	74.5
De Bilt	125.6	331	e 33 44	?SR ₁	—	—	e 65.0	67.9
Ottawa	126.1	37	—	—	—	—	e 64.0	—
Edinburgh	126.1	340	—	—	—	—	72.8	77.5
Eskdalemuir	126.5	340	—	—	—	—	65.0	—
Strasbourg	126.6	326	—	—	—	—	69.0	—
Uccle	126.8	330	—	—	—	—	e 59.0	77.0
Bidston	128.0	340	68 36	?L	73 0	?	(68.6)	79.3
Kew	128.4	335	—	—	—	—	—	86.0
Paris	129.0	330	—	—	—	—	e 74.0	78.0

Additional records: Riverview gives ePR₁ = +8m.5s., MN = +17.5m., MZ = +17.2m.
 Chicago L = +66.0m. Toronto E = +64m.48s. De Bilt e = +54m.3s., MN = +74.4m.

Oct. 21d. Records also at 0h. (San Fernando), 3h. (Lick and near Mizusawa), 4h. (near Athens), 5h. (Cape Town), 9h. (Rocca di Papa), 17h. (Apia).

Oct. 22d. 6h. 5m. 30s. Epicentre $40^{\circ}0'N$. $14^{\circ}0'E$.

$A = +.743$, $B = +.185$, $C = +.643$; $D = +.242$, $E = -.970$;
 $G = +.624$, $H = +.155$, $K = -.766$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Pompeii	0.8	29	0 56	+44	—	—	—	2.5
Rocca di Papa	2.0	331	i 0 34	+ 3	—	—	—	—
Florence	4.3	332	1 13	+ 6	—	—	1.8	2.5
Milan	6.5	328	2 24	+45	4 12	?L	(4.2)	5.2
Moncalieri	6.8	319	1 34	-10	2 39	-26	—	3.7
Marseilles	7.2	300	2 48	+59	3 41	+26	4.9	5.5
Zurich	8.3	334	2 8	+ 2	i 3 50	+ 5	—	4.5
E. N.	8.3	334	2 5	- 1	i 3 51	+ 6	—	5.6
Vienna	8.4	11	2 16	+ 9	(3 31)	-16	3.5	5.3
Algiers	9.1	253	—	—	—	—	e 4.5	7.0
Barcelona	9.1	283	e 2 16	- 2	—	—	5.5	8.2
Besancon	9.2	324	2 26	+ 7	5 25	?L	7.5	7.5
Strasbourg	9.6	334	2 23	- 1	e 3 45	-33	4.0	7.4
Tortosa	10.3	279	2 32	- 2	4 12	-25	4.4	7.9
Paris	12.0	321	e 3 0	+ 1	e 6 1	+42	7.1	6.5
Lemberg	12.1	32	—	—	e 5 36	+15	7.0	9.2
Ucele	12.7	331	e 3 5	- 4	—	—	6.1	—
De Bilt	13.5	336	e 3 16	- 4	—	—	e 6.1	10.1
Granada	14.0	264	3 34	+ 8	6 28	+20	—	—
Kew	15.1	324	—	—	—	—	—	8.5
Oxford	15.8	323	3 47	- 2	6 45	- 5	—	10.7
San Fernando	16.2	264	9 0	?L	—	—	(9.0)	10.0
Coimbra	17.1	278	7 22	?S	(7 22)	+ 2	(8.7)	11.2
Helwan	17.4	120	8 30	?L	—	—	(8.5)	—
Eskdalemuir	19.1	329	4 31	+ 1	8 9	+ 5	9.7	—
Taihoku	86.7	61	44 55	?L	—	—	(44.9)	—

Additional records: Zurich ePZ = +2m.6s., $T_0 = 6h.9m.20s$. Vienna i = +3m.5s. Strasbourg MN = +6.7m., $T_0 = 6h.9m.15s$. Paris MN = +7.5m., $T_0 = 6h.11m.31s$. Lemberg +8m.6s. De Bilt MN = +9.7m. Coimbra records S as P and L as S?, also L = +10.6m., $T_0 = 6h.14m.12s$.

Oct. 22d. Records also at 2h. (Batavia), 5h. (near Marseilles), 6h. (Rocca di Papa (3)), 11h. (Apia), 12h. (Manila), 21h. (near Athens), 22h. (Mauritius).

Oct. 23d. 16h. 3m. 5s. Epicentre $2^{\circ}1'N$. $127^{\circ}8'E$. (as on 1918 Oct. 22d.).

$A = -.612$, $B = +.790$, $C = +.037$; $D = +.790$, $E = +.613$;
 $G = -.022$, $H = +.029$, $K = -.999$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	14.2	332	e 3 25	- 4	—	—	—	—
Batavia	22.5	248	5 6	- 5	9 18	+ 3	—	—
Riverview	42.1	150	—	—	e 14 19	-17	—	27.4
Colombo	48.0	277	—	—	—	—	—	16.9
Honolulu	74.5	69	e 20 25	?S	(e 20 25)	-55	e 37.9	45.9
Helwan	94.5	300	30 55	?SR ₁	—	—	—	—
De Bilt	107.6	326	—	—	—	—	e 54.9	58.9
Ucele	108.6	325	—	—	—	—	e 54.9	—
Paris	110.6	325	—	—	—	—	e 67.9	—

De Bilt gives MN = +59.3m.

Oct. 23d. Records also at 0h. (Honolulu and near Lick), 1h. (near Berkeley), 4h. (near Tokyo, Pompeii, and Rocca di Papa), 6h. (Helwan and San Fernando), 8h. (Rocca di Papa), 10h. (Helwan), 15h. (De Bilt), 20h. (Tokyo, Andalzala, Mendoza, Cipolletti, and La Quiaca).

Oct. 24d. 20h. 32m. 15s. Epicentre $27^{\circ}5N$. $63^{\circ}6E$.

A = +.394, B = +.794, C = +.462; D = +.896, E = -.445;
G = +.205, H = +.414, K = -.887.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Bombay		12.1	133	2 53	- 7	—	—	—	10.1
Simla		12.3	70	e 5 27	?S	(e 5 27)	+ 1	(6.2)	8.8
Kodaikanal		21.7	140	15 9	?	—	—	—	—
Colombo		25.7	140	9 45	?S	(9 45)	-31	15.8	17.8
Helwan	E.	28.3	283	10 45	?S	(10 45)	-19	—	20.2
	N.	28.3	283	10 21	?S	(10 21)	-43	—	16.8
Pompeii		42.1	301	7 58	-14	—	—	—	—
Rocca di Papa		43.5	302	e 8 10	-12	—	—	—	10.2
Moncalieri		47.3	309	e 9 7	+18	16 16	+31	25.8	—
De Bilt	E.	49.5	318	e 9 7	+ 3	16 10	- 3	e 27.8	30.3
	N.	49.5	318	—	—	—	—	e 24.8	29.0
Uccle		49.9	317	e 9 3	- 3	e 16 13	- 5	e 24.8	—
Paris		50.9	313	e 9 8	- 4	e 16 35	+ 5	31.8	—
Bidston		54.5	318	24 57	?L	30 27	?	(25.0)	37.0
Edinburgh		54.6	320	—	—	17 21	+ 5	34.8	39.4

De Bilt gives also $ePR_1E = +11m.2s.$, $eSR_1E = +19m.48s.$, $T_0 = 20h.32m.30s.$

Oct. 24d. Records also at 2h. (near Batavia), 3h. (Rocca di Papa), 5h. (Colombo, Batavia, and Helwan), 8h. (Rio Tinto), 11h. (Edinburgh), 14h. and 23h. (Apia).

Oct. 25d. 13h. 50m. 25s. Epicentre $40^{\circ}0N$. $14^{\circ}0E$. (as on Oct. 22d.).

A = +.743, B = +.185, C = +.643; D = +.242, E = -.970,
G = +.624, H = +.155, K = -.766.

The identity of the origin is not very clearly indicated, though it fits as well as any other. It would seem that several records are one minute in error. The interval from Oct. 22d. 6h. 5.5m. is 3d. 7h. 44.9m. = $228 \times 21.0m. - 3.1m.$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Pompeii		0.8	29	2 5	+113	3 3	+161	—	3.6
Rocca di Papa		2.0	331	1 25	+54	1 57	+62	—	3.2
Florence		4.3	332	1 5	- 2	—	—	—	1.4
Milan		6.5	328	3 59	?L	4 47	?	(4.0)	6.0
Moncalieri		6.8	319	2 0	+16	2 45	-20	—	4.0
Marseilles		7.2	300	3 12	?S	(3 12)	- 3	(4.2)	—
Zurich	E.	8.3	334	2 9	+ 3	2 58	-47	—	3.7
	N.	8.3	334	2 9	+ 3	2 57	-48	—	3.7
Vienna		8.4	11	2 28	+21	(e 3 40)	- 7	e 3.7	4.2
Algiers		9.1	253	e 6 10	?L	—	—	(e 6.2)	—
Besancon		9.2	324	3 22	+63	4 5	- 3	4.6	—
Strasbourg		9.6	334	2 24	0	e 4 2	-16	—	6.9
Paris		12.0	321	e 4 19	?S	(4 19)	-60	7.0	—
Uccle		12.7	331	—	—	e 5 35	- 2	—	—
De Bilt		13.5	336	—	—	—	—	6.3	7.2
Hamburg		13.8	350	—	—	—	—	e 6.6	9.7
Edinburgh		19.5	330	—	—	—	—	10.6	—

Additional records: Florence gives $P? = +55s.$ and $P = +1m.8s.$ Zurich
 $ePZ = +2m.10s.$, $T_0 = 13h.53m.22s.$ Vienna $i = +2m.52s.$, $MZ = +4.3m.$
Paris $eS = +5m.53s.$, $T_0 = 13h.56m.18s.$ De Bilt $MN = +7.0m.$ Ham-
burg $MN = +9.5m.$

Oct. 25d. 17h. 10m. 0s. (I) { Epicentre $37^{\circ}0'N$. $26^{\circ}0'E$. (as on 1919 April 5d.).
 17h. 53m. 20s. (II) }

A = +.718, B = +.350, C = +.602; D = +.438, E = -.899;
 G = +.541, H = +.263, K = -.799.

The interval is near 42.0m.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
I	Athens	2.0	301	0 44	+13	—	—	1.1	1.5
II		2.0	301	0 45	+14	—	—	1.1	1.2
I	Helwan	8.3	146	2 36	+30	—	—	—	12.4
I		8.3	146	2 54	+48	—	—	—	5.8
I	Pompeii	9.7	296	2 27	+1	4 8	-13	6.0	7.0
II		9.7	296	3 38	?S	(3 38)	-43	(6.1)	—
I	Rocca di Papa	11.3	299	2 47	-2	6 0	?L	(6.0)	—
II		11.3	299	2 48	-1	—	—	—	3.9
I	Budapest	11.6	337	—	—	—	—	6.7	—
I	Lemberg	12.9	355	e 3 6	-6	e 4 54	-48	e 7.0	8.3
II		12.9	355	—	—	e 5 4	-38	7.8	8.4
I	Florence	13.1	306	3 23	+9	—	—	6.0	9.0
I	Vienna	13.2	331	i 3 19	+3	i 5 5	-44	i 6.1	9.7
II		13.2	331	3 18	+2	—	—	—	9.3
I	Milan	15.2	309	21 26	?	—	—	—	24.3
I	Moncalieri	15.9	306	i 3 52	+1	7 0	+7	8.8	13.5
II		15.9	306	e 3 32	-19	—	—	11.9	—
I	Zurich	16.5	315	e 4 0	+1	e 7 20	+13	—	—
I	Marseilles	16.9	298	4 12	+8	7 28	+12	11.0	—
I	Strasbourg	17.6	317	i 4 20	+8	i 7 38	+7	9.0	12.6
II		17.6	317	e 5 18	+66	—	—	—	—
I	Besancon	17.9	311	4 21	+5	7 47	+9	11.0	—
I	Algiers	18.3	276	4 22	+1	7 46	-1	12.5	15.5
I	Barcelona	18.9	291	4 28	0	7 56	-4	9.6	15.4
I	Hamburg	19.9	332	e 4 42	-2	i 8 26	+5	—	16.3
II		19.9	332	i 4 43	-1	e 8 28	+7	—	16.3
I	Tortosa	20.1	289	4 39	-3	8 24	-1	9.8	14.6
I	Uccle	20.7	319	e 4 48	-1	8 38	0	e 11.0	13.9
II		20.7	319	e 4 50	+1	—	—	—	—
I	Paris	20.7	312	e 4 51	+2	i 8 40	+2	11.0	15.0
II		20.7	312	6 56	+127	e 8 40	+2	13.7	—
I	De Bilt	21.0	322	4 56	+3	8 48	+4	11.0	15.2
II		21.0	322	e 5 0	+7	—	—	—	15.1
I	Kew	23.5	316	—	—	—	—	—	9.0
I	Granada	23.5	280	5 31	+8	e 9 13	-22	—	—
I	Oxford	24.2	316	5 24	-6	—	—	—	16.7
I	San Fernando	25.7	279	5 42	-3	10 12	-4	—	18.0
I	Bidston	25.9	319	11 18	?S	(11 18)	+58	(15.5)	20.5
I	Eskdalemuir	26.9	322	5 50	-7	10 45	+6	13.8	—
I	Coimbra	26.9	288	6 10	+13	—	—	i 20.8	21.3
I	Edinburgh	27.2	323	5 52	-8	10 48	+3	—	10.9
I	Cape Town	71.3	186	37 48	?L	—	—	(37.8)	44.0

Additional records: Athens (i) gives $iP = +47s.$, $T_0 = 17h. 10m. 11s.$ Athens
 (ii) $iP = +47s.$, $T_0 = 17h. 53m. 32s.$ Moncalieri (i) $MN = +10.8m.$, $T_0 =$
 $17h. 9m. 59s.$ Hamburg (i) $iSE = +8m. 28s.$, $MZ = +13.6m.$, $MN =$
 $+13.7m.$, $T_0 = 17h. 10m. 2s.$ (ii) $MN = +13.6m.$ Paris $iP = +4m. 56s.$,
 $T_0 = 17h. 10m. 5s.$ De Bilt $m = +8m. 52s.$, $MN = +12.4m.$, $T_0 = 17h. 10m. 6s.$
 San Fernando $SE = +10m. 0s.$, $MN = +19.0m.$, $T_0 = 17h. 10m. 18s.$ Coimbra
 has been corrected by $+10m.$ Edinburgh $SR_1 = +11m. 15s.$

Oct. 25d. Records also at 3h. (San Fernando), 5h. (Helwan), 11h., 16h., 17h.
 (8), 18h. (3), and 19h. (Athens), 20h. (Athens (3) and San Fernando),
 21h. (Athens), 22h. (San Fernando).

Oct. 26d. 18h. 4m. 32s. (I) ; Epicentre 2° 1' N. 127° 38' E. (as on Oct. 23d.).
18h. 50m. 46s. (II) ;

A = -0.612, B = +0.790, C = +0.037 ; D = +0.790, E = +0.613 ;
G = -0.022, H = +0.029, K = -0.999.

The intervals from Oct. 23d. 16h. 31m. are 212 X 21.0m. -10.6m. and 214 X 21.0m. -6.3m.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Manila	14.2	332	e 3 26	- 3	—	—	—	—
II	14.2	332	e 3 26	- 3	6 14	+ 1	7.0	7.4
I Batavia	22.5	248	5 5	- 6	e 9 26	+11	—	10.8
II	22.5	248	i 5 10	- 1	9 25	+10	—	11.0
II Riverview	42.1	150	—	—	e 17 14	?SR ₁	—	27.4
II Honolulu	74.5	69	—	—	—	—	38.2	45.7
II Helwan	94.5	300	32 14	?SR ₁	—	—	(44.2)	—
II De Bilt	107.6	326	—	—	—	e 55.2	—	—
II Ucele	108.6	325	—	—	—	e 55.2	—	—

Additional records : Manila II gives MN = +8.9m., T₀ = 18h. 50m. 42s. Batavia gives T₀ = 18h. 50m. 37s., and Epicentre 2° 3' N. 129° 0' E. which would probably do as well or better for this earthquake and for that of Oct. 23d.

Oct. 26d. Records also at 3h. (Marseilles and near Florence and Rocca di Papa), 6h. and 7h. (2) (near Athens), 8h. (Helwan), 9h. (2) and 11h. (near Athens), 14h. (Riverview), 15h. (Helwan), 16h. (Bidston), 20h. (Lick), 21h. (San Fernando), 22h. (Berkeley).

Oct. 27d. 3h. 40m. 48s. Epicentre 16° 0' S. 69° 5' W.

A = +0.337, B = -0.900, C = -0.276 ; D = -0.937, E = -0.350 ;
G = -0.097, H = +0.258, K = -0.961.

A focal depth 0.040 is assumed, as suggested by the Osaka residual.

	Corr. for Focus	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Hts. N.	-2.3	26.9	338	5 0	-34	9 37	-18	14.0	9.9
Washington	-4.4	55.4	353	11 42?	? PR ₁	19 12?	?	e 29.2	—
Ithaca	-4.6	58.8	355	9 42	+ 8	e 17 36	+25	27.5	—
Ann Arbor	-4.6	59.8	349	—	—	—	—	19.2	—
Chicago	-4.6	60.2	346	9 49	+ 6	17 34	+ 5	26.2	—
Toronto	-4.6	60.4	352	10 18	+33	18 30	+59	29.7	31.7
Ottawa	-4.6	61.7	356	10 2	+ 9	18 8	+21	e 27.2	—
Cape Town	-5.1	79.5	123	21 24	?S	21 24	+ 5	—	—
Victoria	-5.1	80.4	328	—	—	—	—	41.5	—
Algiers	-5.3	86.3	50	—	—	e 23 22	+47	48.2	24.7
Bidston	-5.4	89.5	34	8 42	?	20 36	?	—	41.8
Oxford	-5.4	89.8	35	—	—	23 20	+ 8	42.2	—
Paris	-5.4	90.7	39	e 13 31	+41	e 23 59	+37	41.2	49.2
Edinburgh	-5.4	90.7	31	—	—	23 30	+ 8	—	—
Moncalieri	-5.5	92.5	44	e 9 7	?	23 17	-24	45.1	57.2
Ucele	-5.5	92.6	38	—	—	23 38	- 4	e 44.2	—
De Bilt	E.	-5.5	93.5	37	—	e 23 47	- 5	e 45.2	48.8
	N.	-5.5	93.5	37	—	—	—	e 44.2	48.7
Honolulu	-5.5	94.5	291	24 6	?S	(24 6)	+ 3	—	26.4
Rocca di Papa	-5.5	94.9	48	—	—	e 27 42	?	—	—
Hamburg	-5.5	96.8	37	—	—	e 24 12	-15	e 49.2	56.2
Lemberg	-5.7	104.4	42	e 23 6	?	23 42	-121	—	24.1
Helwan	-5.7	107.1	63	—	—	25 12	-57	—	—
Osaka	—	150.9	314	19 14	[-44]	—	—	20.0	20.2
Manila	—	169.9	263	20 12	[- 3]	—	—	—	—

Additional records : Ithaca gives eE = +12m. 11s., T₀ = 3h. 40m. 39s. Toronto i = +6m. 42s., T₀ = 3h. 40m. 54s. Victoria L = +42.8m. Paris MN = +52.2m. De Bilt eSR₁ = +30m. 36s. Lemberg +26m. 24s.

Oct. 27d. Records also at 0h. (San Fernando and near Marseilles), 3h. (near Athens), 8h. (Helwan), 11h. (near Athens), 13h. (Port au Prince), 18h. (Lick), 19h. (near Athens), 21h. (San Fernando).

Oct. 28d. 7h. 23m. 20s. Epicentre $13^{\circ}0'N$. $83^{\circ}0'W$. (as on 1919 July 22d.).

$A = +.119$, $B = -.967$, $C = +.225$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Washington	26.4	10	5 55?	+ 3	10 25?	- 5	—	—
Chicago	29.1	353	—	—	11 40	+21	—	—
Toronto	30.8	5	—	—	—	—	18.4	25.9
Ottawa E.	33.0	9	—	—	e 13 4	+40	e 17.0	—
Paris	77.3	42	—	—	—	—	39.7	—
Uccle	78.3	41	—	—	e 22 28	+24	e 38.7	—
De Bilt	78.6	39	—	—	—	—	e 38.7	40.8

Additional records: Toronto gives $L = +25.0m$. De Bilt $MN = +44.1m$.

Oct. 28d. Records also at 1h. (Mendoza), 13h. (Nagasaki), 16h. (Cape Town), 17h. (Helwan and Batavia), 18h. (Batavia and Mendoza), 19h. (Athens), 23h. (San Fernando).

Oct. 29d. Records at 1h. (Apia, Taihoku, and Lick), 2h. (Kobe (4) and Lick), 12h. (Vienna and Manila), 14h. (Simla and Bombay), 16h., 18h., and 21h. (near Athens).

Oct. 30d. Records at 2h. (San Fernando), 14h. (Dehra Dun), 22h. (near Taihoku), 23h. (De Bilt).

Oct. 31d. 15h. 36m. 20s. Epicentre $27^{\circ}0'S$. $31^{\circ}5'E$.

$A = +.760$, $B = +.466$, $C = -.454$; $D = +.522$, $E = -.853$;
 $G = -.387$, $H = -.237$, $K = -.891$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Cape Town	13.2	235	3 16	0	5 46	- 3	8.7	11.2
Mauritius E.	25.1	80	13 10	?L	—	—	(13.2)	25.2
N.	25.1	80	13 40	?L	—	—	25.2	26.5
Helwan E.	56.9	0	18 58	?S	(18 58)	+73	—	48.5
N.	56.9	0	16 58	?S	(16 58)	-47	—	61.6
Colombo	57.7	61	35 40	?L	42 10	?	46.0	52.7
Kodaikanal	58.0	56	42 22	?	—	—	46.0	49.1
Algiers	69.2	337	e 10 49	-23	17 34	?PR ₁	43.7	50.7
San Fernando E.	72.8	330	17 28	?	—	—	45.2	52.7
N.	72.8	330	17 28	?	—	—	46.7	49.2
Florence	73.2	347	25 40	?SR ₁	—	—	—	36.7
Rio Tinto	74.0	330	19 40	?S	(19 40)	-94	—	50.7
Batavia	74.2	89	e 12 4	+21	e 17 23	?	—	19.8
Moncalieri	75.2	343	e 14 50	?PR ₁	28 17	?SR ₁	44.8	57.9
Coimbra	76.8	330	e 18 38	?	35 2	?L	e 40.7	50.7
Strasbourg	78.6	346	e 12 7	- 4	e 22 0	- 7	e 43.7	58.8
Paris	80.2	341	e 12 21	+ 1	e 22 29	+ 4	45.7	61.7
Uccle	81.5	344	e 12 34	+ 6	—	—	e 38.7	43.8
De Bilt	82.4	345	e 16 4	?PR ₁	e 20 58	-112	e 41.7	44.0
Hamburg	82.8	349	e 12 58	+23	—	—	e 41.7	61.7
Kew	83.3	340	8 40	?	—	—	—	56.7
Oxford	83.9	340	—	—	20 40	-148	39.0	—
Bidston	85.9	340	26 40	?SR ₁	33 40	?L	(33.7)	55.2
Eskdalemuir	87.5	341	21 0	?S	29 13	?SR ₁	40.1	—
Edinburgh	88.0	341	21 10	?S	29 16	?SR ₁	40.7	42.7
Melbourne	90.1	134	16 4	?PR ₁	—	—	—	43.2
Manila	96.1	78	e 14 28	+38	—	—	—	—
Riverview	96.6	134	e 16 12	—	e 21 59	—	e 28.0	36.3
Sydney	96.6	134	16 22	?PR ₁	—	—	40.9	43.5
Lick	155.1	301	i 45 59	?SR ₁	—	—	—	—

Additional records: Moncalieri gives $MN = +57.8m$. Coimbra $ePN = +17m.0s$. (Milne), $P = +19m.30s.$, $i = +36m.26s$. Uccle $MN = +51.4m$.
 De Bilt $e = +28m.39s.$, $eE = +33m.2s.$, $eN = +33m.9s.$, $MN = +50.2m$.
 Hamburg $MN = +53.7m$. Edinburgh $SR_1 = +33m.28s$. Riverview
 $MN = +42.6m.$, $T_0 = 15h.45m.12s.$

Oct. 31d. 19h. 2m. 10s. Epicentre $24^{\circ}0'N$. $116^{\circ}5'E$. (as on 1918 Feb. 13d.).

A = -·408, B = +·817, C = +·407; D = +·895, E = +·446;

G = -·181, H = +·364, K = -·914.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Hokoto	2·8	100	e 0 30	-14	—	—	1·0	—
Taihoku	4·7	76	1 9	-4	—	—	1·6	2·3
Zi-ka-wei	8·4	30	e 2 37	+30	e 4 25	+38	(4·4)	—
Manila	10·3	155	e 2 29	-5	4 42	+5	5·2	6·6
Osaka	19·6	53	4 21	-15	—	—	—	15·9
Tokyo	23·2	54	5 1	-18	9 30	+1	—	—
Batavia	31·7	199	e 7 0	+16	—	—	e 23·0	—
Sydney	66·5	149	19 38	?S	(19 38)	-6	—	37·8
Riverview	66·5	149	—	—	e 18 44	-60	—	36·4
Mauritius	72·1	237	34 38	?L	—	—	(34·6)	—
Helwan	74·4	296	20 50	?S	(20 50)	-29	—	—
Honolulu	77·6	72	e 33 8	?	—	—	40·8	44·1
Vienna	78·7	320	12 56	+45	—	—	e 44·8	46·3
Hamburg	80·0	325	e 13 2	+43	—	—	e 43·8	46·7
De Bilt	83·3	325	—	—	—	—	e 42·8	49·2
Strasbourg	83·7	321	—	—	—	—	e 46·8	50·3
Florence	83·8	317	—	—	—	—	—	47·8
Uccle	84·4	324	—	—	—	—	e 44·8	49·2
Edinburgh	85·2	330	—	—	—	—	43·8	51·6
Eskdalemuir	85·6	330	—	—	—	—	42·5	48·8
Paris	86·5	323	—	—	—	—	47·8	49·8
Kew	86·5	326	46 50	?L	—	—	(46·8)	54·8
Bidston	86·7	329	25 20	?	37 26	?L	(37·4)	52·5
Oxford	86·8	326	—	—	—	—	43·5	54·3
Barcelona	90·8	317	—	—	—	—	e 52·1	57·6
Coimbra	97·9	321	—	—	—	—	e 55·8	—
Rio Tinto	98·3	319	57 50	?L	—	—	(57·8)	65·8
San Fernando E.	99·0	317	57 20	?L	—	—	59·2	60·8

Additional records: Manila gives MN = +6·0m., T_0 = 19h.1m.56s. OsakaMN = +14·3m. Riverview MN = +37·5m. Helwan PE = +23m.50s.
(?SR₁). Hamburg MN = +46·9m., MZ = +51·6m. San Fernando PN
= +56m.50s., MN = +62·3m.

Oct. 31d. 23h. 34m. 0s. A shock near Kobe, for which the records (not easily reconciled) are: Kobe PSE = +23s., PSN = +28s., LEN = +50s., ME = +52s., MN = +53s. Osaka PS = +1m.39s., L = +2·1m., ME = +2·8m., MN = +3·0m. Tokyo P = +3m.12s., S = +4m.14s. Zi-ka-wei e = +5m.5s.

Oct. 31d. Records also at 0h. (Nagasaki), 1h. (near Kobe), 4h. (San Fernando), 14h. (near Mizusawa), 17h. (Azores and near Mizusawa), 18h. (Simla and Moncalieri), 21h. (near Athens (2)).

Nov. 1d. Records at 0h. (Helwan), 1h. (Athens (2) and San Fernando), 5h. (Berkeley, Toronto, and Taihoku), 6h. (San Fernando), 10h. (Helwan), 14h. (Athens), 16h. (Apia), 17h. (Athens), 20h. (San Fernando), 22h. (Tokyo), 23h. (Athens and Kobe).

Nov. 2d. 19h. 30m. 24s. Epicentre $65^{\circ}0'N$. $41^{\circ}0'W$.

A = +·319, B = -·277, C = +·906; D = -·656, E = -·755;

G = +·684, H = -·594, K = -·423.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	20·3	98	4 48	+3	8 36	+7	9·6	11·1
Eskdalemuir	20·7	100	(4 48)	-1	4 48	?P	9·0	—
Kew	24·7	103	—	—	—	—	—	11·6
De Bilt	26·4	97	—	—	—	—	e 12·1	14·7
Uccle	27·1	99	e 5 58	-1	—	—	e 11·6	—
Hamburg	27·5	90	e 6 0	-3	—	—	e 14·6	18·5
Paris	27·9	104	—	—	—	—	e 13·6	—
Coimbra	31·0	129	12 36	?S	(12 36)	+45	—	—
San Fernando	35·2	129	14 6	?L	—	—	(14·1)	17·6
Helwan	55·8	92	37 36	?L	—	—	(37·6)	—

De Bilt gives MN = +15·3m.

Nov. 2d. Records also at 4h. (Rocca di Papa), 5h. (Athens (4)), 8h. (Helwan and Apia), 11h. (Athens and Manila), 13h. (Apia), 15h. (Rocca di Papa, Barcelona, Paris, Hamburg, Uccle, De Bilt, Kew, Bidston, Eskdalemuir, Edinburgh, and Helwan), 21h. (Helwan).

Nov. 3d. Records at 2h. (Helwan), 8h. (Taihoku), 10h. (Kobe and Osaka), 13h. (Apia), 14h. (Manila), 22h. (Lick (2) and Taihoku), 23h. (Helwan).

Nov. 4d. Records at 0h. (San Fernando), 3h. (Helwan), 5h. (Taihoku), 6h. and 8h. (Helwan), 13h. (Helwan, Batavia, Osaka, Manila, and Zi-ka-wei), 14h. (De Bilt), 15h. (Batavia, Manila (2) and Mizusawa), 17h. (Helwan), 19h. (Athens), 21h. (San Fernando).

Nov. 5d. Records at 0h. (Zi-ka-wei and Lick (2)), 5h. (Athens), 6h. (Kobe), 8h. (Edinburgh, Helwan and De Bilt), 9h. (Helwan), 14h. (Zi-ka-wei), 15h. (Helwan, Kobe, and Taihoku), 16h. (Taihoku), 20h. (Manila, Sydney, and Honolulu), 21h. (Uccle, De Bilt, and Bidston), 22h. (Simla).

Nov. 6d. 7h. 13m. 10s. Epicentre $13^{\circ}5'N$. $59^{\circ}0'W$.

$A = +.501$, $B = -.834$, $C = +.233$; $D = -.857$, $E = -.515$;

$G = +.120$, $H = -.200$, $K = -.972$.

A focal depth of 0.010 radius has been assumed, since although there is no evidence from the Antipodes, that of other stations seems clear. Six stations (Vieques, La Paz, Coimbra, Uccle, De Bilt, Hamburg) give closely consistent determinations of T_0 . La Paz is in azimuth nearly opposite the mean of Vieques and European stations, and without an allowance for depth of focus all the values of Δ would be too large.

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
					m. s.	s.	m. s.	s.	m.	m.
Vieques	N.	-0.1	7.8	308	1 50	- 7	3 13	-16	4.2	4.9
Georgetown	E.	-0.7	30.0	331	6 19	- 2	12 26	+64	—	—
	N.	-0.7	30.0	331	6 24	+ 3	12 15	+53	—	—
Washington		-0.7	30.0	331	—	—	e 10 50	-32	—	—
La Paz		-0.7	31.3	196	6 32	- 2	i 11 42	- 2	15.0	18.3
Ottawa		-0.8	34.9	340	—	—	—	—	13.8	—
Toronto		-0.8	34.9	334	—	—	—	—	14.6	—
Ann Arbor	N.	-0.8	35.9	329	2 38	?	—	—	13.8	15.4
Chicago		-0.8	37.6	323	8 15	+47	12 54	-27	15.3	—
Coimbra		-1.0	51.6	49	e 8 50	-21	15 50	-36	23.3	24.8
Rio Tinto		-1.0	52.3	51	16 50	? S	(16 50)	+15	—	23.8
San Fernando	E.	-1.0	52.3	54	16 50	? S	(16 50)	+15	—	26.3
	N.	-1.0	52.3	54	16 14	? S	(16 14)	-21	—	28.8
Bidston		-1.2	59.2	37	18 50	? S	(18 50)	+51	—	29.8
Oxford		-1.2	59.7	38	—	—	—	—	—	30.4
Eskdalemuir		-1.2	59.8	33	—	—	(18 50)	+44	18.8	—
Kew		-1.2	60.2	38	25 50	? L	—	—	(25.8)	37.8
Paris		-1.2	61.3	41	—	—	e 17 50	-34	27.8	34.8
Uccle		-1.2	62.9	40	e 10 20	- 3	18 41	- 3	e 24.8	—
Victoria		-1.2	63.0	319	34 41	? L	—	—	(34.7)	38.6
De Bilt		-1.2	63.6	39	10 27	- 1	18 53	0	e 25.8	33.0
Strasbourg		-1.2	64.6	42	—	—	e 18 50	-16	e 28.8	—
Hamburg		-1.2	66.8	38	e 10 50	+ 1	e 19 32	0	e 26.8	34.8

Additional records: Vieques gives $LE = +4.3m.$, $T_0 = 7h.13m.18s.$ Ottawa
 $LE = +19.8m.$ Toronto $eL = +25.9m.$ Chicago $L = +20.8m.$, T_0
 $= 7h.15m.34s.$ Paris $MN = +27.8m.$ De Bilt $MN = +28.1m.$, $T_0 =$
 $7h.13m.13s.$ Hamburg $MN = +36.8m.$, $T_0 = 7h.13m.18s.$

Nov. 6d. Records also at 1h. (Mizusawa), 5h. (Taihoku), 6h. (Mizusawa), 13h. (Kobe, Osaka, Mizusawa, Manila, and Zi-ka-wei), 16h. (Manila, Zi-ka-wei, Taihoku, and Osaka), 17h. (De Bilt, Honolulu, Helwan, Hamburg, and Uccle), 18h. (Zi-ka-wei).

Nov. 7d. Records at 7h. (Edinburgh), 10h. (Simla), 13h. (Florence), 15h. (Helwan), 17h. (Edinburgh), 22h. (San Fernando).

Nov. 8d. Records at 3h. (Port au Prince, Vieques, and La Paz), 4h. (La Paz), 7h. (Manila), 8h. (Osaka), 12h. (Batavia), 17h. (Zi-ka-wei), 21h. (La Paz).

Nov. 9d. Records at 2h. (San Fernando), 7h. (Manila and Batavia), 8h. (Zi-ka-wei), 9h. and 11h. (La Paz).

Nov. 10d. Records at 3h. (San Fernando), 8h. (Kingston), 9h. (Helwan), 11h. (Manila and Florence), 12h. (La Paz), 18h. (Berkeley), 20h. (San Fernando).

Nov. 11d. Records at 7h. and 15h. (Helwan), 19h. (San Fernando), 20h. (La Paz).

Nov. 12d. Records at 0h. (Helwan and La Paz), 1h. (La Paz), 2h. (Rocca di Papa), 4h. (Zurich and Vienna), 8h. (Helwan), 10h. (Zi-ka-wei), 11h. (Florence, Mizusawa, and Osaka), 13h. (Florence, La Paz, and Helwan), 14h. (La Paz, Mizusawa, Osaka, and Tokyo), 16h. (Mizusawa, Ootomari, and San Fernando).

Nov. 13d. Records at 5h. (Taihoku), 6h. (San Fernando and Batavia), 7h. (Melbourne and La Paz), 8h. (Tokyo), 13h. (Paris), 14h. (Zi-ka-wei), 15h. (Apia and Taihoku), 16h. (Azores), 20h. (Lick), 21h. (Batavia).

Nov. 14d. 6h. 38m. 35s. Epicentre $11^{\circ}0'N$. $108^{\circ}0'W$.

A = -·303, B = -·934, C = +·191; D = -·951, E = +·309;

G = -·059, H = -·182, K = -·982.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tucson	21·4	353	10 1	?L	—	—	(10·0)	10·8
Chicago	35·5	28	11 6	?	18 3	?L	(18·0)	—
Victoria	39·5	343	18 31	?L	—	—	20·0	24·0
La Paz	48·1	125	8 55	0	15 55	0	24·4	25·9
Apia	67·9	251	—	—	21 25	+84	—	—
De Bilt	95·0	35	—	—	—	—	e 47·4	53·4

Apia only gives its record as 7h.

Nov. 14d. Records also at 1h. (Helwan), 7h. (Helwan, Granada, San Fernando, Uccle, and De Bilt), 8h. (Rio Tinto, La Paz, (2), and Athens), 13h. (Batavia), 15h. (Tokyo), 17h. (Zi-ka-wei, Manila, and Taihoku), 18h. (De Bilt and Edinburgh).

Nov. 15d. Records at 4h. (Helwan), 6h. (Calcutta, Colombo, and Kodaikanal), 8h. (Taihoku), 11h. (Helwan), 13h. (Helwan and La Paz), 17h. (San Fernando), 22h. (Apia, Florence, and La Paz), 23h. (San Fernando).

Nov. 16d. 3h. 5m. 33s. Epicentre $15^{\circ}5'N$. $109^{\circ}0'E$.

A = -·314, B = +·911, C = +·267; D = +·946, E = +·326;

G = -·087, H = +·253, K = -·964.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Manila	11·6	92	e 2 51	- 2	—	—	—	—
Zi-ka-wei	19·4	34	—	—	e 8 11	+ 1	—	—
Batavia	21·8	186	i 5 5	+ 2	9 5	+ 4	—	12·1
Colombo	29·8	257	15 27	?L	—	—	(15·4)	18·4
Helwan	N. 71·9	297	21 27	?S	(21 27)	+38	—	—
La Paz	177·1	250	20 12	[- 5]	—	—	58·9	64·6

Helwan gives PE = +25m.27s.

Nov. 16d. Records also at 4h. (Zurich), 6h. (Batavia), 7h. (La Paz), 10h. (Taihoku), 17h. (Tokyo and San Fernando), 20h. (San Fernando).

Nov. 17d. Records at 0h. (La Paz), 4h. (Uccle), 19h. (Rocca di Papa and La Paz),
21h. (Helwan), 22h. (San Fernando and Manila).

Nov. 18d. 3h. 58m. 35s. Epicentre $4^{\circ}5'S$. $131^{\circ}0'E$. (as on 1919 June 28d.).

A = -0.654, B = +0.752, C = -0.078; D = +0.755, E = +0.656;
G = +0.051, H = -0.059, K = -0.997.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	21.5	333	e 5 6	+ 7	8 25	-30	9.4	9.7
Batavia	24.1	267	i 5 21	- 8	9 42	- 4	e 13.4	10.8
Taihoku	30.9	345	6 45	+ 8	(11 42)	- 8	11.7	—
Adelaide	31.2	168	—	—	10 49	-65	14.1	16.2
Sydney	34.9	150	11 43	?S	(11 43)	-71	17.6	19.6
Melbourne	35.7	161	12 1	?S	(12 1)	-65	19.7	21.4
Zi-ka-wei	36.9	346	e 7 28	- 1	e 13 54	+32	—	—
Kobe	39.3	6	7 42	- 7	—	—	13.9	15.3
Osaka	39.5	6	7 50	- 1	—	—	13.8	14.5
Tokyo	41.0	11	10 50	?	14 8	-13	—	—
Mizusawa	44.6	12	8 30	0	15 10	0	—	—
Calcutta	49.7	306	9 13	+ 8	16 25	+10	—	—
Colombo	52.4	282	9 25	+ 3	16 25	-24	34.9	35.4
Simla	62.4	310	18 7	?S	(18 7)	-46	—	37.2
Honolulu	74.2	66	e 24 19	?SR ₁	—	—	34.0	51.7
Helwan	100.6	298	18 25	?PR ₁	—	—	—	—
Victoria	103.9	41	24 29	?S	(24 29)	-123	47.1	56.2
Cape Town	105.9	233	51 31	?L	—	—	(51.5)	—
Vienna	109.6	320	e 19 25	?PR ₁	—	—	—	—
Hamburg	111.6	326	e 19 43	?PR ₁	e 29 7	+85	e 57.4	66.4
Rocca di Papa	113.9	314	—	—	—	—	e 59.6	68.2
De Bilt	114.9	325	—	—	—	—	e 58.4	60.5
	N.	114.9	325	—	—	—	e 54.4	59.2
Bidston	117.3	331	22 25	?PR ₁	32 37	?	—	66.1
Paris	117.9	324	i 40 16	?	—	—	62.4	—
Algiers	122.5	310	20 35	?PR ₁	—	—	—	—
Chicago	129.3	36	22 32	?PR ₁	—	—	59.4	—
San Fernando	129.4	315	8 25	?	—	—	—	—
Toronto	132.5	31	—	—	—	—	46.4	—
Ottawa	132.9	26	i 22 52	?PR ₁	—	—	39.4	—
Georgetown	137.2	31	e 23 9	?PR ₁	—	—	—	—
Washington	137.2	31	e 22 25	?PR ₁	—	—	—	—
La Paz	151.7	138	19 46	[-12]	34 1	?	71.6	74.7

Additional records: Manila gives MN = +10.0m., T_0 = 3h.59m.34s. Batavia
 T_0 = 3h.58m.28s. Epicentre $5^{\circ}6'S$. $131^{\circ}2'E$. Adelaide PR₁ = +8m.19s.
Sydney S = +15m.31s. Melbourne S = +16m.49s., SR₁ = +18m.7s.
Osaka MN = +17.0m. Mizusawa PN = +8m.37s., T_0 = 3h.58m.40s.
Calcutta SN = +16m.31s. Helwan PN = +20m.25s. Victoria S =
+32m.51s. (?SR₁). De Bilt ePR₁E = +20m.10s. Chicago L = +41.4m.
and +75.4m. Toronto L = +32.7m. and +47.7m. La Paz iP =
+19m.56s. (O-C = [-2]).

1919. Nov. 18d. 21h. 54m. 38s. Epicentre $39^{\circ}6'N$. $27^{\circ}7'E$.

A = +0.682, B = +0.358, C = +0.637; D = +0.465, E = -0.885;
G = +0.564, H = +0.296, K = -0.770.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3.5	242	i 0 52	- 3	i 1 37	0	i 1.7	1.8
Budapest	10.0	324	2 34	+ 4	—	—	—	—
Pompeii	10.1	281	i 2 26	- 5	i 4 11	-21	e 6.2	7.4
Helwan	10.2	162	2 46	+13	—	—	—	11.0
	N.	10.2	162	3 4	+31	—	—	11.4
Lemberg	10.5	347	e 2 52	+15	e 5 4	+21	e 6.4	7.8
Pola	11.5	301	2 43	- 9	(e 5 4)	- 3	e 5.1	7.0
Rocca di Papa	11.6	285	2 50	- 3	5 8	- 1	7.0	8.3
Vienna	11.8	320	3 1	+ 5	5 4	-10	—	7.5
Florence	12.9	294	3 23	+11	5 43	+ 1	—	7.5
Moncalieri	15.7	296	i 3 43	- 5	i 6 53	+ 5	8.6	10.0
Zurich	15.8	306	e 3 49	0	i 7 0	+10	—	—
Strasbourg	16.8	309	4 1	- 1	7 24	+11	9.4	10.1

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Marseilles	17.1	290	4 12	+ 6	7 29	+ 9	11.2	12.5
Besancon	17.4	303	4 10	0	7 27	0	10.4	—
Hamburg	18.4	325	e 4 29	+ 7	i 7 46	- 3	e 9.4	11.2
Barcelona	19.4	284	i 4 27	- 7	i 8 3	- 7	8.7	13.4
Algiers	19.5	269	4 33	- 2	8 13	0	9.5	13.4
Uccle	19.8	312	i 4 36	- 3	i 8 19	0	10.1	11.7
De Bilt	19.9	316	4 42	+ 2	i 8 23	+ 2	9.1	11.6
Paris	20.1	305	i 4 42	0	i 8 26	+ 1	10.4	11.4
Tortosa	20.7	282	4 45	- 4	8 13	- 25	9.2	14.1
Kew	22.7	310	8 22	?S	(8 22)	-57	—	16.4
Oxford	23.4	311	—	—	9 28?	- 5	—	20.1
Granada	24.5	274	i 4 9	-84	i 8 42	-72	—	—
Stonyhurst	24.8	315	—	—	(10 22)	+23	(12.4)	15.1
Bidston	25.0	314	12 46	?L	16 28	—	(12.8)	33.4
Edinburgh	26.0	319	10 12	?S	(10 12)	-10	(14.7)	15.8
Dyce	26.2	322	e 5 44	- 6	i 10 10	-16	12.2	16.2
San Fernando	26.7	274	5 52	- 3	9 58	- 37	15.9	19.4
Rio Tinto	26.7	277	6 22	+27	—	—	—	23.4
Coimbra	27.5	283	(6 1)	- 2	(10 31)	-19	10.5	11.0
Azores	41.1	284	13 10	?S	(13 10)	-72	—	36.1
Bombay	43.8	104	9 31	+67	—	—	—	28.3
Kodaikanal	52.9	110	24 34	?L	—	—	32.4	40.7
Colombo	56.9	111	18 22	?S	(18 22)	+37	35.9	36.6
Ottawa	70.9	314	—	—	i 20 45	+ 8	e 31.8	—
Ithaca	E. 73.1	312	—	—	e 19 12	-111	29.2	—
Zi-ka-wei	73.3	62	—	—	e 32 10	?L	(e 32.2)	—
Toronto	74.0	315	11 40	- 2	20 10	-64	e 29.9	47.0
Cape Town	74.0	189	35 46	?L	39 34	?	43.3	44.6
Georgetown	75.6	310	—	—	—	—	43.0	—
Washington	75.6	310	—	—	21 38	+ 5	34.1	—
Ann Arbor	E. 77.2	316	—	—	—	—	35.4	—
Chicago	79.7	318	—	—	21 28	-52	39.4	—
Tokyo	82.1	50	—	—	—	—	e 47.9	—
Manila	83.2	79	—	—	—	—	e 50.7	—
Batavia	85.6	102	e 12 14	-37	22 43	-43	36.4	25.2
Victoria	88.4	341	34 54	?	39 49	?	46.2	53.6
Berkeley	97.8	338	49 24	?L	—	—	49.4	—
Lick	98.0	338	—	—	—	—	e 52.5	—
Honolulu	118.8	6	65 58	?L	—	—	70.4	76.4
Melbourne	132.0	110	e 73 22	?L	—	—	83.4	85.9
Sydney	135.0	101	67 46	?L	—	—	78.0	81.5

Additional records: Athens gives P = +1m.4s., i = +1m.28s., MN = +2.4m.,
T₀ = 21h.54m.33s. Moncalieri MN = +10.4m., T₀ = 21h.54m.26s.
Strasbourg MN = +10.0m., T₀ = 21h.54m.27s. Marseilles MN = +11.7m.,
T₀ = 21h.54m.46s. Barcelona PR₁ = +4m.58s., T₀ = 21h.54m.36s.
Algiers MN = +17.0m., T₀ = 21h.54m.36s. Uccle MN = +11.6m., T₀ =
21h.54m.36s. De Bilt iSN = +8m.25s., T₀ = 21h.54m.44s. Edinburgh
gives S as P and L as S. San Fernando MN = +16.8m., T₀ = 21h.55m.24s.
Colombo S = +21m.22s. Ottawa L = +35.4m. and +44.4m., LE =
+63.4m. Toronto E = +17m.52s. (?PR₁), eL = +46.2m. Georgetown
LN = +38.8m., eLZ = +46.0m., LZ = +49.4m. Washington L = +38.9m.
and +45.4m. Chicago L = +45.4m., L = +50.4m. Berkeley PE =
+47m.5s.

Nov. 18d. Records also at 0h. (Sydney), 11h. (Tokyo), 14h. (Mauritius), 15h. and
16h. (Stonyhurst), 22h. (La Paz).

Nov. 19d. Records at 1h. (Algiers), 2h. (Stonyhurst), 14h. (Helwan), 19h.
(Berkeley and Lick), 21h. (San Fernando).

1919. Nov. 20d. 14h. 11m. 38s. Epicentre $13^{\circ}0S$. $166^{\circ}8E$.

(as on 1918 Dec. 14d.).

A = -0.949, B = +0.222, C = -0.225; D = +0.228, E = +0.974;

G = +0.219, H = -0.051, K = -0.974.

A depth of focus 0.040 has been assumed from the evidence of the antipodal stations, but seems rather too great. Probably 0.030, as on 1918 Dec. 14d., would suffice.

	Corr. for Focus	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	-1.7	20.8	95	i 4 31	+ 1	8 25	+21	9.4	—
Sydney	E. -2.1	25.2	213	5 10	- 8	8 52	-35	11.0	11.6
Melbourne	-2.7	31.5	214	(6 26)	+10	10 52	-21	14.2	17.2
Adelaide	-2.9	33.5	224	7 16	+41	11 40	- 6	15.2	18.2
Honolulu	-3.9	48.6	46	i 8 10	-21	15 40	+29	27.0	31.0
Manila	-4.3	53.2	300	e 9 3	+ 4	13 45	-140	16.1	16.8
Tokyo	-4.4	55.0	334	9 14	+ 3	14 21	-125	18.5	—
Osaka	-4.4	56.2	329	9 25	+ 6	(16 54)	+13	16.8	18.6
Kobe	-4.5	56.4	330	9 20	+ 1	(16 55)	+12	16.9	18.2
Mizusawa	E. -4.5	57.4	339	9 28	+ 3	17 27	+32	—	—
	N. -4.5	57.4	339	9 29	+ 4	17 7	+12	—	—
Taihoku	-4.5	58.3	311	9 33	+ 1	(17 15)	+ 9	17.2	—
Batavia	-4.6	59.4	270	9 51	+13	17 45	+26	23.0	—
Zi-ka-wei	-4.6	62.1	316	e 9 2	-54	18 9	+16	—	—
Ootomari	-4.7	63.4	343	9 15	-48	—	—	—	—
Berkeley	-5.2	83.5	49	i 12 10	+ 1	(e 22 20)	+16	34.6	—
	Z. -5.2	83.5	49	i 12 11	+ 2	(e 22 17)	+13	—	—
Lick	-5.3	83.8	50	e 12 54	+44	e 23 22	+76	—	—
Calcutta	E. -5.3	84.6	295	12 16	+ 1	(22 40)	+25	22.6	—
	N. -5.3	84.6	295	12 22	+ 7	(22 34)	+19	22.6	—
Victoria	-5.3	86.9	36	12 37	+ 9	(22 27)	-15	e 45.2	25.9
Colombo	-5.4	88.7	277	11 22	-76	11 22	? P	21.8	22.2
Kodaikanal	-5.4	91.6	280	23 10	? S	(23 10)	-22	55.2	57.2
Mauritius	—	102.7	246	17 10	?	22 4	?	—	52.4
Chicago	—	110.2	49	18 52	? PR ₁	28 27	+57	55.4	—
Ann Arbor	—	113.1	49	—	—	—	—	48.4	—
Toronto	—	116.1	47	—	—	25 34	-165	46.6	—
La Paz	—	118.1	117	18 41	? PR ₁	29 42	-67	—	—
Ithaca	—	118.3	48	—	—	—	—	64.2	—
Ottawa	—	118.4	45	—	—	e 29 31	+54	e 53.4	—
Washington	—	118.4	51	—	—	e 28 22	-15	63.4	—
Georgetown	—	118.4	51	—	—	e 29 22	+45	e 63.0	—
	—	118.4	51	—	—	e 29 53	+76	65.4	—
	Z. —	118.4	51	—	—	e 30 10	+93	63.3	—
Cape Town	—	124.2	212	36 34	? SR ₁	—	—	—	82.4
Hamburg	—	135.5	340	e 19 12	-19	i 22 37	? PR ₁	e 63.4	74.4
Vienna	—	137.1	331	i 19 6	-28	—	—	e 20.7	22.8
De Bilt	E. —	138.2	343	i 21 57	? PR ₁	40 0	? SR ₁	e 64.4	66.1
	N. —	138.2	343	i 22 44	? PR ₁	39 57	? SR ₁	—	65.6
Bidston	—	138.8	349	17 10	?	22 22	? PR ₁	—	73.2
Uccle	—	139.6	343	19 10	?	—	—	—	—
Strasbourg	—	140.4	338	e 18 54	-46	22 52	? PR ₁	—	—
Zurich	—	141.1	336	e 19 4	-37	—	—	—	—
Paris	—	141.9	345	i 19 14	-29	e 22 55	? PR ₁	—	—
Besancon	—	142.2	339	19 30?	-13	23 2	? PR ₁	—	—
Florence	—	142.8	330	19 13	-32	21 42	? PR ₁	—	40.4
Pompeii	—	143.2	324	19 11	-34	22 22	? PR ₁	—	—
Moncalieri	—	143.4	335	i 19 14	-32	34 53	?	57.7	—
Rocca di Papa	—	143.5	326	i 19 19	-27	—	—	—	19.4
Marseilles	—	145.8	336	19 27	23	19 32	?	—	19.7
Barcelona	—	148.4	337	19 29	24	—	—	19.8	—
Tortosa	—	149.7	339	19 28	-27	22 50	? PR ₁	23.8	28.5
Algiers	—	152.1	332	19 33	26	23 34	? PR ₁	85.4	111.4
Coinbra	—	152.5	352	18 22	-97	30 22	?	41.4	76.4
Granada	—	154.3	342	19 42	-19	20 8	?	—	—
San Fernando	—	155.7	346	19 10	-53	23 22	? PR ₁	—	111.8

For Notes see next page.

NOTES TO NOV. 20d. 14h. 11m. 38s.

Additional records and notes: Apia gives $PR_1 = +5m.11s.$, $T_0 = 14h.11m.10s.$
 Melbourne gives P as PR_1 . Honolulu $SR_1 = +20m.22s.$ Manila MN =
 $+16.7m.$ Berkeley eSN = $+28m.10s.$, LN = $+34.5m.$, $T_0 = 14h.25m.56s.$
 The P and S are given as Ps of two local shocks. Victoria S = $+16m.14s.$,
 ? PR_1 . The true S is given as L. Mauritius MN = $+57.6m.$ Chicago
 L = $+35.2m.$, $+59.4m.$, and $+68.4m.$ Toronto L = $+29.6m.$ Ottawa
 L = $+62.4m.$ and $+66.4m.$ Washington L = $+66.4m.$ Uccle PR_1
 = $+22m.3s.$ Strasbourg $e_1 = +19m.14s.$, $e_2 = +22m.10s.$, $e_3 = +22m.32s.$,
 S? = $+23m.29s.$, $e = +26m.54s.$, and $+33m.57s.$ Rocca di Papa eP =
 $+18m.55s.$, MN = $+19.8m.$ Algiers LM = $+30.4m.$ San Fernando
 MN = $+107.8m.$

Nov. 20d. Records also at 4h. (Helwan), 5h. (Taihoku), 6h. (La Paz), 8h. (Bidston), 14h. (Moncalieri), 15h. (Rocca di Papa and Toronto), 16h. (Toronto, Victoria, and Taihoku), 20h. (Helwan), 21h. (Manila), 22h. (Manila, Helwan, and Lick).

Nov. 21d. 2h. 6m. 24s. Epicentre $22^\circ 0S. 114^\circ 7E.$

A = -0.387 , B = $+0.842$, C = -0.375 ; D = $+0.908$, E = $+0.418$;
 G = $+0.157$, H = -0.340 , K = -0.927 .

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Batavia	17.5	333	e 4 12	+ 1	—	—	—	12.6
Adelaide	24.5	127	5 33	0	9 54	0	14.0	15.8
Melbourne	30.4	128	—	—	—	—	e 15.6	21.6
Sydney	34.1	118	10 0	+174	—	—	15.9	16.8
La Paz	141.4	176	17 0	-17	—	—	—	—

No additional records.

Nov. 21d. Records also at 0h. (Helwan), 2h. and 4h. (Florence), 10h. (Batavia), 15h. (Manila), 16h. (La Paz), 18h. (Rocca di Papa), 19h. (Lick (2)), 20h. (Lick and Berkeley), 21h. (Lick, San Fernando, and Granada), 23h. (Helwan).

Nov. 22d. Records at 0h. (Helwan), 1h. (Vieques), 2h. (Rocca di Papa), 5h. (Helwan), 9h. (Zurich), 14h. (Florence), 18h. (La Paz), 21h. (San Fernando), 23h. (Granada and Berkeley).

Nov. 23d. 5h. 57m. 30s. Epicentre $0^\circ 0. 135^\circ 0E.$

A = -0.707 , B = $+0.707$, C = 0.000 ; D = $+0.707$, E = $+0.707$;
 G = 0.000 , H = 0.000 , K = -1.000 .

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Manila	20.1	317	—	—	—	—	e 8.1	—
Taihoku	28.2	334	—	—	—	—	e 12.9	—
Batavia	28.8	257	7 34	-11	—	—	36.9	9.0
Osaka	34.7	1	6 5	-66	—	—	—	16.0
Perth	36.7	209	7 30	+ 2	13 19	- 1	20.7	—
Sydney	37.1	159	9 42	+131	13 36	+11	15.6	16.7
Melbourne	38.9	168	—	—	16 24	? SR_1	18.5	20.5
Colombo	55.4	280	35 30	?L	—	—	(35.5)	57.5
Honolulu	68.6	69	e 20 12	?S	(e 20 12)	+ 3	33.0	37.5
Victoria	97.8	41	26 1	?S	(26 1)	+27	40.7	49.1
Helwan	101.8	300	20 30	? PR_1	—	—	—	—
Hamburg	109.9	329	—	—	—	—	e 59.5	73.5
Cape Town	111.8	232	57 6	?L	—	—	(57.1)	69.6
De Bilt	113.2	329	—	—	e 32 30	? SR_1	e 64.5	68.3
Rocca di Papa	113.5	317	—	—	e 36 48	? SR_1	e 53.7	54.7
Uccle	114.3	328	—	—	36 30	? SR_1	e 58.5	—
Moncalieri	115.4	320	—	—	e 48 20	?	71.4	—
Bidston	116.3	333	35 12	? SR_1	40 24	?	—	122.5
Chicago	123.3	37	—	—	—	—	58.5	—
Toronto	126.7	30	—	—	e 66 0	?L	e 74.2	80.8
Ottawa	127.1	25	—	—	—	—	60.5	—
Coimbra	127.8	324	—	—	e 42 10	? SR_1	64.5	66.0
La Paz	151.8	127	i 19 33	[-26]	—	—	71.1	93.9

Additional records: Osaka gives MN = $+16.9m.$ Honolulu eS = $+26m.18s.$
 Victoria S = $+32m.54s.$ Helwan ePN = $-7m.30s.$ De Bilt MN =
 $+68.8m.$ Chicago L = $+62.5m.$ and $+127.5m.$ Ottawa L = $+75.5m.$
 and $+85.5m.$

Nov. 23d. Records also at 1h. (Zurich), 4h. (La Paz), 7h. (Zi-ka-wei), 8h. (Sydney, Batavia, and Adelaide), 16h. (La Paz), 20h. (Mizusawa), 22h. (Helwan).

Nov. 24d. Records at 0h. (Osaka and Tokyo), 1h. (San Fernando), 2h. (Helwan), 5h. (La Paz), 6h. (Helwan), 11h. (Batavia and Colombo), 18h. (La Paz and Lick), 19h. (Lick and Helwan), 20h. (Rocca di Papa), 21h. (Helwan).

Nov. 25d. Records at 1h. (Tokyo), 11h. (Lick and Berkeley), 12h. (Colombo), 19h. (Lick), 21h. (La Paz).

Nov. 26d. Records at 2h. and 3h. (Helwan), 4h. (Colombo), 8h. (Honolulu), 14h. (Manila), 20h. (La Paz).

Nov. 27d. Records at 1h. (San Fernando), 4h. (Batavia), 7h. (Barcelona and Tortosa), 10h. (La Paz), 19h. (San Fernando), 22h. (Apia).

Nov. 28d. 14h. 8m. 0s. Epicentre $55^{\circ}0'N$, $35^{\circ}0'W$. (as on 1919 July 12d.).

A = +.470, B = -.329, C = +.819; D = +.574, E = -.819;

G = +.671, H = -.470, K = -.574.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	17.9	75	4 12	- 4	7 50	+12	—	11.4
Dyce	18.2	69	4 26	+ 7	7 52	+ 8	—	10.0
Azores	18.4	156	—	—	—	—	—	12.0
Bidston	18.6	82	4 12	-12	9 0	?L	(9.0)	22.0
Oxford	20.2	85	4 49	+ 6	8 48	+21	—	11.4
Paris	23.6	89	e 5 26	+ 2	e 9 47	+11	12.0	14.0
De Bilt	23.7	80	e 5 29	+ 4	9 44	+ 6	11.6	13.8
Uccle	23.8	83	e 5 25	- 1	e 9 23	- 7	e 11.5	—
Hamburg	25.8	74	i 5 44	- 2	10 12	- 6	14.2	17.9
Besancon	26.5	90	—	—	10 22	-10	14.0	—
Strasbourg	26.8	86	e 6 0	+ 4	e 10 39	+ 2	e 15.0	18.2
San Fernando	27.0	122	6 24	+26	—	—	13.5	15.0
Tortosa	27.3	106	6 9	+ 8	10 44	- 2	12.6	18.9
Ottawa	27.3	266	—	—	i 10 18	-28	e 15.7	—
Barcelona	27.7	104	—	—	e 10 52	- 2	e 16.0	18.7
Moncalieri	28.7	94	e 6 21	+ 6	11 28	+16	15.9	17.8
Toronto	30.5	266	e 4 30	-123	—	—	14.5	21.7
Washington	32.2	258	—	—	e 14 0	+109	19.8	—
Georgetown	32.2	258	—	—	e 12 0	-11	19.8	—
Rocca di Papa	33.5	92	—	—	i 11 18	-74	e 17.5	21.0
Chicago	36.3	271	13 0	?S	(13 0)	-14	(19.1)	21.8
Victoria	51.4	302	—	—	—	—	—	27.4
Helwan	E. 52.6	90	18 0	?S	(18 0)	+69	—	—

Additional records: Azores gives P = 14h.3m.18s. De Bilt MN = +14.2m.,
 T_0 = 14h.8m.10s. Epicentre $56^{\circ}7'N$, $34^{\circ}6'W$. Hamburg MN = +15.8m.,
 MZ = +16.0m., T_0 = 14h.8m.7s. San Fernando MN = +16.5m. Ottawa
 iS?E = +11m.24s., LE = +20.0m. Moncalieri MN = +17.1m., T_0 =
 14h.7m.54s. Toronto L = +17.7m. Georgetown eN? = +15m.0s.
 Victoria P? = 14h.4m.28s. Helwan PN = +15m.0s.

Nov. 28d. 21h. 38m. 10s. Epicentre $43^{\circ}5'N$, $7^{\circ}5'E$.

A = +.719, B = +.095, C = +.688.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Moncalieri	1.5	i 0 25	+ 2	0 40	- 2	—	2.0
Marseilles	1.5	i 0 25	+ 2	0 39	- 3	—	—
Florence	1.6	-0 13	-37	0 6	-39	—	—
Besancon	2.7	1 50	?L	—	—	(1.8)	—
Zurich	3.9	1 17	+16	2 11	+24	—	—
Barcelona	3.9	e 1 3	+ 2	1 46	- 1	—	—
Strasbourg	4.5	e 2 11	+61	2 58	+54	3.1	3.9
Tortosa	5.1	1 20	+ 1	e 2 17	- 3	—	3.8
Paris	5.8	2 4	?	—	—	3.0	3.9
Algiers	6.4	1 44	+ 6	i 3 12	+17	3.8	3.8
Uccle	7.5	—	—	e 5 56	?	6.3	—
Vienna	7.6	e 1 50	- 5	—	—	—	—
De Bilt	7.8	e 2 50	+52	—	—	—	—
Hamburg	8.7	—	—	c 4 38	?L	e 5.0	5.2
Coimbra	10.4	—	—	—	—	e 5.8	8.6
	12.3	3 29	+26	6 13	+52	8.2	—

Additional records: Moncalieri gives MN = +1.9m. Paris e = +2m.36s.
 De Bilt MN = +5.4m. Hamburg MN = +7.5m. Coimbra LN = +7.8m.

Nov. 28d. Records also at 14h. (Coimbra), 22h. (De Bilt).

Nov. 29d. 0h. 25m. 20s. (I) $\left\{ \begin{array}{l} \text{Epicentre } 40^{\circ} 8' \text{N. } 0^{\circ} 5' \text{E. (near Tortosa).} \\ \text{0h. 26m. 30s. (II)} \end{array} \right.$

A = +.757, B = +.007, C = +.654; D = +.009, E = -1.000;
G = +.654, H = +.006, K = -.757.

There appears to have been two shocks at the times given above.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Tortosa	0.0	—	0 30	+30	—	—	0.8	—
I Barcelona	1.4	64	10 25	+ 4	10 43	+ 4	—	0.8
II	1.4	64	10 26	+ 5	—	—	11.1	—
I Marseilles	4.4	56	1 12	+ 4	1 51	-10	—	2.0
II Algiers	4.5	152	e 0 49	-21	2 25	+21	3.0	—
I Moncalieri	6.7	49	1 46	+ 4	2 36	-26	3.2	—
II Coimbra	6.8	269	e 1 39	- 5	2 41	- 24	3.5	3.7
I Besancon	7.5	30	1 56	+ 2	3 13	-11	—	—
I Paris	8.1	10	e 1 52	-11	e 3 17	-23	4.0	4.7
I Florence	8.5	66	—	—	—	—	—	4.7
I Zurich	8.7	38	c 2 10	- 2	—	—	—	—
I Strasbourg	9.3	31	2 15	- 5	e 4 1	- 9	—	—
I Uccle	10.3	14	e 2 10	-24	—	—	—	—
I De Bilt	11.5	14	—	—	—	—	e 5.1	6.7
I Vienna	13.5	51	e 6 40	?L	—	—	(e 6.7)	—
I Hamburg	14.3	24	—	—	—	—	e 5.7	8.3
I Edinburgh	15.2	352	—	—	6 40	+ 3	—	7.9

Additional records: Coimbra gives LN = +3.7m., MN = +3.8m. Paris
ME = +3.7m. De Bilt eN = +5m.13s.

Nov. 29d. Records also at 4h. (Athens), 8h. (San Fernando), 11h. and 14h. (Helwan), 17h. (Tokyo).

Nov. 30d. Records at 4h. (San Fernando), 5h. (Manila), 6h. (Tokyo), 10h. (Rio Tinto), 12h. (Azores), 14h. (Helwan and Colombo), 15h. (Taihoku), 20h. (San Fernando), 21h. (Manila).

Dec. 1d. Records at 0h. (Manila), 16h. (Osaka), 18h. (Manila), 22h. (Tokyo).

Dec. 2d. Records at 0h. (San Fernando), 6h. (Tokyo), 12h. (Bidston), 13h. (Florence, Rocca di Papa, and Pompeii), 14h. (Florence and Denver), 15h. (La Paz), 18h. (Taihoku), 20h. (Tortosa and Barcelona), 21h. (San Fernando).

Dec. 3d. Records at 2h. (Victoria), 9h. (Apia and La Paz), 10h. (Cape Town and Helwan), 13h. (La Paz), 14h. (Manila), 22h. (San Fernando).

Dec. 4d. Records at 0h. (Cape Town), 1h. (San Fernando and Helwan), 4h. (La Paz), 6h. (Mizusawa), 13h. and 15h. (Rocca di Papa), 19h. (Tokyo), 20h. (Rocca di Papa), 23h. (San Fernando).

Dec. 5d. 0h. 15m. 26s. Epicentre $13^{\circ} 0' \text{N. } 85^{\circ} 4' \text{W.}$

A = +.078, B = -.971, C = +.225; D = -.997, E = -.080;
G = +.108, H = -.224, K = -.974.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mobile	17.8	352	1 3 56	-19	(7 20)	-16	7.3	—
Vieques	19.9	72	5 33	+53	9 13	+52	10.4	10.6
	19.9	72	10 9	?S	(10 9)	+108	17.6	18.1
Georgetown	26.9	14	e 5 57	0	e 10 34	- 5	e 13.4	—
Washington	26.9	14	5 59	+ 2	10 39	0	—	—
Chicago	28.8	355	6 44	+28	10 43	-30	14.6	—
Ann Arbor	29.3	3	—	—	13 10	?	17.9	—
Ithaca	30.4	13	e 8 19	?PR ₁	12 32	+51	—	—
Toronto	31.1	9	—	—	—	—	32.3	—
Ottawa	33.4	13	6 54	- 6	13 4	+34	18.8	—
La Paz	34.1	150	17 6	0	i 12 42	0	17.2	20.0
Victoria	47.3	326	17 2	?S	(17 2)	+77	26.0	28.5
Bidston	75.0	40	—	—	19 46	-100	—	38.9
De Bilt	80.1	40	—	—	—	—	e 38.6	41.7
Helwan	105.6	53	24 34	?S	(24 34)	-134	—	—

For Notes see next page.

NOTES TO DEC. 5d. 0h. 15m. 26s.

Additional records: Mobile gives S? - \div 5m.6s. (?PR₁). Ann Arbor (Wiechert)
 SE = +12m.34s., LE = +18.1m. Ithaca eN = +12m.30s. Ottawa
 PR₁N = +8m.12s., T₀ = 0h.14m.33s. La Paz T₀ = 0h.15m.30s. Vic-
 toria S = +21m.37s. De Bilt MN = +49.3m. Helwan PN =
 +39m.34s.

Dec. 5d. Records also at 4h. and 6h. (Helwan), 10h. (Berkeley), 15h. (Colombo), 23h. (Helwan).

Dec. 6d. Records at 0h. (San Fernando), 6h. (Apia and Algiers), 11h. (Bidston), 19h. (La Paz), 21h. (San Fernando).

Dec. 7d. Records at 0h. and 1h. (La Paz), 3h. (Athens), 6h. (La Paz), 9h. (Rio Tinto), 10h. and 22h. (Helwan).

Dec. 8d. Records at 3h. (San Fernando and Taihoku), 5h. (Colombo), 10h. (La Paz), 15h. (Apia), 17h. (La Paz and Florence), 20h. (San Fernando).

Dec. 9d. 20h. 23m. 15s. Epicentre 19° 8'N. 103° 3'E. (as on 1918 Mar. 22d.).

A = -0.216, B = +0.916, C = +0.339; D = +0.973, E = +0.230;
 G = -0.078, H = +0.330, K = -0.941.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Calcutta	E.	14.2	284	3 33	+ 4	6 3	-10	8.5	—
	N.	14.2	284	3 39	+10	6 9	- 4	8.8	—
Simla		26.0	301	8 9	?	—	—	—	12.8
Colombo		26.1	244	19 45	?	—	—	—	21.8
Helwan		65.1	295	37 45	?L	—	—	(37.8)	—
De Bilt		79.3	322	—	—	—	—	e 39.8	42.6
Uccle		80.2	321	—	—	—	—	e 39.8	—
Eskdalemuir		82.7	327	—	—	—	—	43.8	—

Additional records: Helwan gives PN = +36m.45s. De Bilt MN = +42.2m.

Dec. 9d. 20h. 28m. 6s. Epicentre 26° 0'N. 114° 0'E. (as on 1917 Jan. 27d.).

A = -0.366, B = +0.821, C = +0.438.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Taihoku	6.9	—	—	3 24	+17	3.9	4.2
Zi-ka-wei	8.4	c 2 6	- 1	e 3 50	+ 3	—	5.5
Manila	13.2	c 2 44	-32	—	—	—	—

Zi-ka-wei gives also MN = +4.6m., T₀ = 20h.28m.5s.

Dec. 9d. Records also at 0h. (San Fernando), 4h. (Mizusawa), 7h. (Athens (2)), 10h. (Tokyo), 18h. (Taihoku), 19h. (Kew), 22h. (San Fernando).

Dec. 10d. Records at 3h. and 5h. (Tokyo), 7h. (Sydney), 14h. (Nagasaki), 21h. and 22h. (San Fernando), 23h. (Helwan).

Dec. 11d. Records at 2h. (La Paz and Azores), 6h. (Mizusawa), 14h. (Zurich), 16h. (Osaka), 22h. (Helwan), 23h. (Berkeley, Lick, and Honolulu).

Dec. 12d. Records at 0h. (San Fernando, Uccle, De Bilt, Tokyo, Rocca di Papa, Helwan, Eskdalemuir, and Bidston), 3h. (Batavia, Manila, Melbourne, and Perth), 4h. (Toronto, Victoria, and Honolulu), 8h. (Rio Tinto), 11h. (La Paz), 12h. (La Paz, Pompeii, and Rocca di Papa), 14h. (Denver), 18h. (Batavia), 23h. (Apia).

Dec. 13d. Records at 0h. (San Fernando), 3h. (Taihoku), 9h. (Helwan).

Dec. 14d. 1h. 10m. 5s. Epicentre $29^{\circ}2'S$. $177^{\circ}0'W$. (as on 1917 May 9d.).

$$A = -.872, B = -.046, C = -.488; \quad D = -.052, E = +.999; \\ G = +.487, H = +.026, K = -.873.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia		16.1	18	e 4 19	+26	—	—	8.9	—
Sydney		27.5	251	(6 1)	- 2	6 1	?P	12.5	14.6
Melbourne		32.7	244	—	—	12 19	0	16.8	18.9
Honolulu		53.8	22	16 13	?S	(16 13)	-53	e 28.4	41.0
Perth		57.0	249	—	—	17 36	-10	—	—
Batavia		74.9	271	c 11 46	- 2	i 21 30	+ 5	e 40.0	44.2
Taihoku	E.	80.2	306	—	—	—	—	35.9	—
Berkeley		84.3	40	—	—	e 40 51	?L	48.6	—
Victoria		91.3	32	21 57	?	29 19	?SR ₁	—	50.0
La Paz		97.6	114	e 14 39	+41	—	—	47.0	48.5
Mauritius		107.7	234	50 25	?L	—	—	(50.4)	65.2
Chicago		108.5	51	—	—	—	—	e 49.9	—
Ann Arbor		111.4	52	—	—	—	—	65.9	—
Toronto		114.8	52	—	—	(27 31)	-37	63.4	67.3
Georgetown		115.0	58	—	—	—	—	64.9	—
Capetown		115.2	194	63 13	?L	—	—	(63.2)	72.2
Ithaca		116.5	54	—	—	—	—	e 68.4	—
Ottawa		117.8	51	—	—	—	—	66.9	—
Eskdalemuir		153.5	8	—	—	—	—	79.9	—
Hamburg		155.1	350	—	—	—	—	e 80.9	—
Bidston		155.4	9	37 13	?	45 19	?SR ₁	—	56.7
Helwan	E.	155.4	279	26 55	?PR ₁	—	—	—	—
De Bilt		157.1	357	—	—	—	—	e 88.9	91.9
Kew		157.6	6	—	—	—	—	—	93.9
Uccle		158.4	358	—	—	—	—	49.9	—
Paris		160.4	1	—	—	—	—	e 90.9	—
Zurich	E.	161.3	348	—	—	e 85 38	?L (e 85.6)	—	—
Coimbra		165.5	37	e 35 55	?	47 10	?SR ₁	59.9	94.9

Additional records : Apia gives $e? = 1h.4m.18s.$ Sydney gives $P = 1h.9m.48s.$
 Honolulu gives S as P and $S = +23m.43s.$ Chicago $L = +62.9m.$ and
 $+65.9m.$ Toronto $eL = +65.6m.$ and $+69.4m.$ Helwan $PN =$
 $+28m.55s.$ Zurich $eSN = +85m.37s.$ (?eLN). Florence gives a record
 from 2h. to 3h.

Dec. 14d. Records also at 0h. (Toronto), 1h. (San Fernando), 2h. (Kodaikanal),
 3h. (Toronto and Victoria), 6h. (Taihoku), 9h. (Algiers), 19h. (San
 Fernando).

Dec. 15d. Records at 1h. (Sitka), 3h. (Bidston), 6h. (Helwan), 8h. (Mizusawa),
 9h. (Osaka), 16h. (La Paz, Batavia, and Manila), 17h. (Helwan), 19h.
 (Helwan and Sydney), 20h. (Toronto, Helwan, De Bilt, and Victoria),
 21h. (Uccle).

Dec. 16d. 11h. 41m. 25s. Epicentre $24^{\circ}0'N$. $124^{\circ}0'E$. (as on 1916 Mar. 25d.).

$$A = -.511, B = +.757, C = +.407; \quad D = +.829, E = +.559; \\ G = -.228, H = +.337, K = -.914.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Taihoku		2.5	294	0 32	- 7	—	—	0.8	1.1
Hokoto		4.1	275	e 1 31	+27	1 38	-15	1.9	—
Zi-ka-wei		7.5	343	e 2 2	+ 8	—	—	—	4.3
Manila		9.8	197	—	—	e 4 19	- 4	—	—
Helwan	N.	80.4	298	33 35	?L	—	—	(33.6)	—
Hamburg		83.9	327	—	—	—	—	e 50.6	53.6
De Bilt		87.2	327	—	—	—	—	e 45.6	55.3
Uccle		88.3	327	—	—	—	—	e 42.6	—
Eskdalemuir		88.8	333	—	—	—	—	48.6	—
Kew		90.1	329	—	—	—	—	—	58.6
Bidston		90.1	332	—	—	49 35	?L	(49.6)	57.3

Additional records : Zi-ka-wei gives $MN = +4.4m.$ Helwan $PE = +54m.35s.$
 De Bilt $MN = +56.5m.$

Dec. 16d. Records also at 0h. (San Fernando and Manila), 10h. (Helwan), 16h. (Apia), 17h. (Algiers).

Dec. 17d. Records at 0h. (Toronto), 2h. (Tokyo), 4h. (Helwan), 18h. (San Fernando), 20h. (Mizusawa), 23h. (Manila, Melbourne, Batavia, Honolulu, and Perth).

Dec. 18d. 1h. 20m. 35s. Epicentre $20^{\circ}0'N$. $99^{\circ}0'W$. (as on 1918 Aug. 22d.).

$$A = -0.147, B = -0.928, C = +0.342; \quad D = -0.988, E = +0.156; \\ G = -0.053, H = -0.338, K = -0.940.$$

An origin half a degree further south would fit the observation better, but the old epicentre is retained, as the whole material is so scanty.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tucson	E.	16.2	322	4 8	+13	—	—	8.6	9.2
	N.	16.2	322	4 5	+10	—	—	8.6	9.1
Denver	E.	20.4	347	8 25	?S	(8 25)	-7	—	10.4
Chicago		23.8	21	5 31	+5	9 55	+15	12.4	—
Georgetown		26.7	40	e 6 2	+7	11 25	+50	—	—
Victoria		34.5	331	14 23	?S	(14 23)	+95	18.3	20.8
La Paz		47.4	138	18 41	-9	15 42	-4	23.0	23.0

Helwan ($\Delta = 110^{\circ}9'$) records PE = +9m.25s. and PN = +5m.25s., perhaps intended for L, but given an hour too soon by mistake.

Dec. 18d. Records also at 0h. (Victoria and San Fernando), 19h. (San Fernando), 20h. (Perth), 23h. (De Bilt).

Dec. 19d. Records at 7h. (Algiers), 13h. (Berkeley and Lick), 15h. (La Paz), 19h. (San Fernando).

Dec. 20d. 0h. 28m. 15s. Epicentre $37^{\circ}0'N$. $138^{\circ}5'E$. (as on 1919 Mar. 28d.).

$$A = -0.599, B = +0.529, C = +0.602; \quad D = +0.663, E = +0.749; \\ G = -0.451, H = +0.399, K = -0.799.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo		1.6	142	0 23	-1	0 37	-8	0.9	—
Mizusawa		2.9	44	0 20	-25	0 48	-32	—	—
Osaka		3.5	227	—	—	1 18	-19	2.8	3.5
Kobe		3.6	230	—	—	2 0	+21	3.7	5.6
Zi-ka-wei		15.3	253	e 3 46	+3	—	—	—	—
De Bilt		82.1	331	—	—	—	—	e 49.8	—
Uccle		83.5	331	—	—	—	—	—	47.8
Helwan		84.6	302	—	—	—	—	55.8	—
La Paz		148.8	55	19 25	[-29]	—	—	—	—

Additional records: Mizusawa gives SN = +0m.47s. Kobe MN = +5.3m.

1919. Dec. 20d. 19h. 34m. 0s. Epicentre $23^{\circ}0'N$. $121^{\circ}7'E$.

$$A = -0.484, B = +0.783, C = +0.391; \quad D = +0.851, E = +0.526; \\ G = -0.205, H = +0.332, K = -0.920.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Taihoku		1.9	359	0 38	+9	—	—	1.5	1.6
Hokoto		2.1	284	0 49	+16	—	—	1.3	1.6
Zi-ka-wei		8.2	358	2 3	-1	e 4 15	+33	—	—
Manila		8.4	185	e 2 41	+34	4 26	+39	4.9	5.1
Kobe		16.5	42	4 3	+4	(7 36)	+29	7.6	13.4
Osaka		16.7	43	4 22	+21	(7 17)	+6	7.3	12.8
Mizusawa	E.	23.0	41	5 12	-5	9 22	-3	—	—
	N.	23.0	41	5 10	-7	9 20	-5	—	—

Continued on next page.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Calcutta	E.	30.7	276	6 18	-17	12 18	+32	19.3	—
Batavia		32.6	207	i 6 32	-21	e 12 32	+14	e 18.6	—
Dehra Dun		39.5	289	—	—	15 0	+61	—	—
Simla		40.2	290	14 30	?S	(14 30)	+20	21.8	22.2
Colombo		43.3	256	16 0	?S	(16 0)	+68	27.8	28.9
Kodaikanal		44.1	260	24 42	?L	—	—	28.8	34.0
Bombay		45.6	275	8 37	0	—	—	—	34.4
Sydney	E.	63.4	151	19 0	?S	(19 0)	- 6	30.7	37.8
Honolulu		73.3	73	e 27 12	?SR ₁	—	—	42.9	49.5
Helwan	E.	79.2	298	22 30	?S	(22 30)	+16	—	54.4
	N.	79.2	298	23 30	?S	(23 30)	+76	—	51.7
Vienna		82.6	320	i 12 38	+ 4	—	—	e 43.0	53.5
Hamburg		83.6	326	—	—	—	—	e 42.0	46.4
Pola		85.7	317	—	—	—	—	—	46.0
De Bilt		86.8	326	—	—	e 23 36	- 3	40.0	48.8
Dyce	E.	87.1	332	i 31 16	?SR ₁	—	—	43.6	48.0
Strasbourg		87.4	321	—	—	—	—	46.0	—
Florence		87.8	319	31 28	?SR ₁	—	—	45.1	48.6
Rocca di Papa		87.9	315	e 12 48	-16	20 42	- 9	e 47.7	54.7
Uccle		88.0	325	e 13 0	- 5	—	—	e 40.0	48.8
Edinburgh		88.4	331	—	—	—	—	44.0	51.1
Eskdalemuir		88.8	331	—	—	—	—	38.0	—
Moncalieri		88.9	320	16 8	?PR ₁	31 8	?SR ₁	46.1	52.6
Besancon		89.2	321	—	—	—	—	48.0	—
Kew		89.9	328	44 0	?L	—	—	(44.0)	55.0
Paris		90.1	325	—	—	—	—	e 46.0	49.0
Oxford		90.2	328	—	—	—	—	45.1	52.5
Barcelona		94.7	320	—	—	—	—	e 51.6	57.3
Coimbra	E.	101.7	323	27 12	?	—	—	53.7	56.6
	N.	101.7	323	e 28 43	?	39 15	?	52.2	63.8
San Fernando		102.9	320	—	—	—	—	56.5	61.0
Chicago		109.8	22	—	—	—	—	e 55.0	—
Capetown		113.1	241	58 12	?L	—	—	70.7	74.2
La Paz		168.7	57	20 31	[+17]	29 45	?	43.9	46.7

Additional records: Manila gives MN = +5.0m., T_0 = 19h.34m.33s. Kobe
 MN = +20.0m. Osaka MN = +14.1m. Nagasaki (Δ = 12°.1) gives
 P at 19h.4m.23s., L at 19h.6m.40s. Colombo S = +26m.0s. Vienna
 MN = +46.0m. Hamburg MZ = +50.9m. De Bilt MN = +48.9m.
 Dyce LN = +44.0m., MN = ME. Moncalieri MN = +50.9m. San
 Fernando MN = +67.2m. Chicago L = +61.0m. and +70.0m.

1919. Dec. 20d. 20h. 37m. 24s. Epicentre 23°·0N. 121°·7E.

(as at 19h.).

A = -·484, B = +·783, C = +·391; D = +·851, E = +·526.

G = -·205, H = +·332, K = -·920.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Taihoku		1.9	359	0 38	+ 9	—	—	1.6	1.7
Hokoto		2.1	284	1 12	+39	(1 12)	+14	1.6	2.0
Zi-ka-wei		8.2	358	e 2 17	+13	e 3 43	+ 1	—	—
Manila		8.4	185	e 2 15	+ 8	4 0	+13	4.4	4.9
Kobe		16.5	42	4 3	+ 4	(7 30)	+23	7.5	10.8
Osaka		16.7	43	4 9	+ 8	(7 13)	+ 2	7.2	9.4
Mizusawa	E.	23.0	41	5 16	- 1	9 24	- 1	—	—
	N.	23.0	41	5 16	- 1	9 15	-10	—	—
Ootomari		29.1	30	6 16	- 3	(11 10)	- 9	11.2	15.6
Calcutta	E.	30.7	276	6 24	-11	13 18	+92	17.9	19.9
	N.	30.7	276	6 24	-11	13 12	+86	17.6	19.9
Batavia		32.6	207	6 32	-21	11 51	-27	e 18.6	26.6
Dehra Dun		39.5	289	8 36	+45	—	—	—	—
Simla		40.2	290	13 30	?S	(13 30)	-40	21.3	22.1
Colombo		43.3	256	8 36	+16	15 18	+26	18.2	19.1
Kodaikanal		44.1	260	8 30	+ 3	(14 36)	+27	14.6	28.5
Bombay		45.6	275	8 33	- 4	15 10	-12	—	28.8
Adelaide		60.1	163	10 54	+41	18 18	- 6	28.1	40.8
Sydney	E.	63.4	151	18 42	?S	(18 42)	-26	30.6	38.8
Melbourne		64.6	160	19 36	?S	(19 36)	+16	35.0	38.1
Honolulu		73.3	73	e 21 24	?S	(e 21 24)	+18	45.1	50.1
Helwan	E.	79.2	298	—	—	—	—	—	51.0

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Budapest	81.3	320	8 42	?	—	—	—	—
Vienna	82.6	320	i 12 30	- 4	24 14	+81	e 38.6	43.6
Hamburg	83.6	326	e 12 43	+ 3	—	—	e 39.6	46.6
De Bilt	86.8	326	—	—	23 41	+ 2	e 39.6	48.9
Dyce	87.1	332	—	—	—	—	e 40.9	48.4
Strasbourg	87.4	321	—	—	—	—	e 41.6	60.0
Zurich	87.6	320	e 13 1	- 2	—	—	e 45.6	—
Florence	87.8	319	22 59	?S	(22 59)	-51	e 41.7	—
Rocca di Papa	87.9	315	e 13 2	- 2	—	—	e 47.3	54.3
Uccle	88.0	325	e 13 3	- 2	23 50	- 2	e 40.6	48.9
Victoria	88.0	36	23 26	?S	(23 26)	-26	38.3	52.3
Edinburgh	88.4	331	—	—	—	—	e 40.6	51.3
Moncalieri	88.9	320	4 41	?	24 46	+44	43.7	52.5
Besancon	89.2	321	—	—	—	—	e 45.6	—
Stonyhurst	89.4	330	43 36	?L	—	—	(43.6)	50.1
Bidston	89.9	330	26 36	?S	(26 36)	-143	(37.8)	48.2
Kew	89.9	328	40 36	?L	—	—	(40.6)	54.6
Paris	90.1	325	e 13 25	+ 8	—	—	e 42.6	47.6
Oxford	90.2	328	—	—	—	—	e 41.2	50.6
Marseilles	91.7	320	e 32 36	?SR ₁	—	—	—	47.6
Barcelona	94.7	320	—	—	—	—	e 44.8	52.6
Algiers	96.9	315	—	—	—	—	e 54.6	64.9
Coimbra	101.7	323	22 6	?	32 49	?SR ₁	48.8	56.5
San Fernando	102.9	320	—	—	—	—	e 55.6	59.6
Chicago	109.8	22	—	—	—	—	e 39.6	—
Ottawa	109.8	12	—	—	—	—	e 50.6	—
Toronto	110.6	16	e 28 18	?S	38 42	?	52.4	66.7
E. Ithaca	112.5	13	—	—	—	—	e 57.1	—
Georgetown	115.6	16	—	—	—	—	e 57.6	—
Washington	115.6	16	—	—	—	—	e 57.6	—
La Paz	168.7	57	i 20 24	[+10]	34 42	?	81.6	100.2

Additional records: Manila gives MN = +5.0m., T₀ = 20h.37m.31s. Kobe MN = +13.2m. Osaka MN = +10.0m. Nagasaki (Δ = 12°.1) gives P at 20h.7m.46s., L at 20h.10m.30s. Sydney gives S as P and S = 25m.42s. Melbourne gives S as P and S = +26m.18s., SR₁ = +31m.36s. Helwan MN = +48.3m. Hamburg MZ = +51.2m. De Bilt eSR₁ = +29m.24s., MN = +49.0m. Dyce i = +26m.36s. and +33m.18s., LN = +40.6m., MN = +50.3m. Florence gives records also at +46m.36s. and +55m.36s. Uccle SR₁ = +29m.37s., MN = +48.7m., T₀ = 20h.37m.37s. Victoria gives S as P and S = +28m.54s., L = +61.4m. Moncalieri MN = +53.0m. Coimbra eN = +22m.36s., MN = +57.1m. San Fernando MN = +59.1m. Chicago L = +43.1m., +57.6m., +62.6m., and +69.6m. Ottawa LE = +64.6m., +72.6m., and +81.6m. Toronto e? = +26m.6s., eL = +63.6m., +73.7m., and +89.3m. Ithaca LE = +66.0m. Georgetown L = +66.9m. Washington L = +67.6m., and +72.6m.

Dec. 20d. 21h. 38m. 55s. Epicentre 23° 0'N. 121° 7'E. (as at 19h. and 20h.).

	Δ °	Az. °	P. m. s.	O-C. s.	L. m.	M. m.
Taihoku	1.9	359	5 54	?	—	—
Zi-ka-wei	8.2	358	—	—	e 6.4	—
Kobe	16.5	42	3 57	- 2	5.0	5.6
Osaka	16.7	43	4 1	0	5.5	8.2
Mizusawa	N. 23.0	41	5 23	- 6	—	—
Hamburg	83.6	326	—	—	e 48.1	54.1
De Bilt	86.8	326	—	—	e 49.1	56.9
Uccle	88.0	325	—	—	e 48.1	—

Additional records: Kobe gives MN = +5.9m. Osaka MN = +8.1m. Mizusawa PE = +5m.29s. De Bilt MN = +56.4m.

Dec. 20d. Records also at 8h. (Helwan), 13h., 14h., and 15h. (Tokyo), 17h. (Apia), 23h. (Taihoku).

Dec. 21d. Records at 5h. and 6h. (Taihoku), 7h. (Tokyo), 9h. (Batavia), 18h. (Victoria and Toronto), 19h. (Nagasaki (2)), 22h. (Simla).

Dec. 22h. 23h. 40m. 48s. Epicentre 39° - $3N$, 21° - $0E$. (as on 1918 Feb. 1d.).

A = +.722, B = +.277, C = +.633; D = +.358, E = -.934;

G = +.591, H = +.227, K = -.774.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	2.6	120	i 1 8	+27	i 1 12	0	(i 1.3)	2.4
Rocca di Papa	6.8	294	1 46	+ 2	3 14	+ 9	4.2	6.1
Pola	7.6	319	e 1 36	-19	—	—	e 3.6	4.2
Florence	8.5	305	1 18	-51	3 28	-22	4.6	—
Vienna	9.4	341	2 22	0	4 29	+16	—	6.6
Lemberg	10.7	11	e 2 18	-22	4 6	-42	—	5.8
Moncalieri	11.3	305	2 42	- 7	4 45	-17	6.6	9.7
Zurich	12.1	316	e 2 58	- 2	i 5 16	- 5	—	7.3
Marseilles	12.4	294	e 3 18	+13	7 22	?L	(7.4)	—
Helwan	E. 12.7	135	6 0	?L	—	—	(6.0)	14.8
	N. 12.7	135	3 18	+ 9	—	—	—	14.3
Strasbourg	13.3	319	3 20	+ 3	e 6 0	+ 9	6.8	7.8
Besancon	13.4	311	3 19	+ 1	7 29	?L	(7.5)	—
Algiers	14.3	266	3 25	- 5	6 19	+ 4	8.2	12.7
Barcelona	14.5	285	2 43	-50	i 4 13	-127	e 6.8	10.2
Tortosa	15.7	283	3 50	+ 2	(6 12)	-36	6.2	12.4
Hamburg	16.1	336	e 3 52	- 1	e 6 45	-12	e 8.7	12.4
Paris	16.2	312	e 3 58	+ 3	e 7 3	+ 3	9.2	13.2
Uccle	16.4	320	3 55	- 2	7 0	- 4	8.0	—
De Bilt	16.8	325	4 3	+ 1	7 12	- 1	7.8	10.3
Kew	19.1	315	—	—	—	—	—	12.2
Oxford	19.8	316	i 3 57	-42	(8 15)	- 4	8.2	12.0
San Fernando	21.6	271	7 24	?S	(7 24)	-93	12.0	14.2
Bidston	21.6	319	5 18	+18	8 48	- 9	—	13.7
Coimbra	E. 22.5	281	5 15	+ 4	i 9 23	+ 8	12.6	14.4
	N. 22.5	281	5 26	+15	9 19	+ 4	12.2	14.7
Eskdalemuir	22.7	323	—	—	(9 11)	- 8	9.2	12.2
Edinburgh	23.0	324	—	—	9 49	+24	12.2	13.8
Dyce	E. 23.4	328	i 5 19	- 2	i 9 31	- 2	12.6	14.2
	N. 23.4	328	i 5 19	- 2	i 9 25	- 8	11.6	14.2
Simla	45.9	82	27 36	?L	—	—	(27.6)	—
Toronto	70.3	311	—	—	—	—	e 41.8	—
Cape Town	73.2	183	40 12	?L	—	—	(40.2)	41.9
Victoria	86.8	339	42 50	?L	—	—	(42.8)	52.2
La Paz	99.7	258	—	—	—	—	54.8	61.2

Additional records: Athens gives L as a second iP and S as i, also mE = +1m.34s., mN = +1m.31s., S = +1m.48s., iL = +1.9m., MN = +2.6m., T_0 = 23h.41m.5s. Pola MN = +3.2m. All these records are given for 23d. Florence +6m.12s. Moncalieri MN = +9.3m., T_0 = 23h.40m.59s. Zurich MN = +7.4m., T_0 = 23h.40m.57s. Hamburg MN = +10.8m., MZ = +12.6m., T_0 = 23h.41m.6s. Paris MN = +9.2m., T_0 = 23h.40m.57s. De Bilt MN = +10.0m., T_0 = 23h.40m.57s. Toronto L = +46.0m.

Dec. 22d. Records also at 2h. (Denver), 4h. (Athens), 7h. (La Paz and Helwan), 10h. (Helwan), 12h. (Athens), 21h. (Helwan), 23h. (Athens (2)).

Dec. 23d. Records at 4h. (Athens and Zurich), 9h. (La Paz and Apia), 10h. and 11h. (Taihoku), 13h. (La Paz), 15h. (La Paz, Batavia, Helwan, and Manila), 16h. (De Bilt), 19h. (Rocca di Papa), 20h. (Helwan, Cipolletti, Andalgala, La Quiaa, Mendoza, and La Paz), 22h. (Apia).

Dec. 24d. Records at 1h. (Helwan), 4h. (La Paz), 11h. (Helwan and San Fernando), 13h. (Helwan), 17h. (Rocca di Papa), 19h. (Athens), 20h. (Taihoku), 23h. (Pompeii and Tokyo).

Dec. 25d. 21h. 42m. 20s. Epicentre $45^{\circ}0'N$. $36^{\circ}0'E$.

A = +.572, B = +.416, C = +.707; D = +.588, E = -.809;

G = +.572, H = +.416, K = -.707.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Lemberg	9.4	305	e 3 28	+66	—	—	e 5.4	5.6
Vienna	13.8	291	e 3 22	-1	7 21	?L	(7.4)	10.7
Pola	15.6	277	e 7 45	?S	(7 45)	+59	e 9.9	10.4
Helwan	15.6	196	6 40	?S	(6 40)	-6	(9.7)	—
Rocca di Papa	17.2	267	—	—	—	—	e 5.8	11.8
Hamburg	18.9	306	e 4 19	-9	—	—	e 10.2	13.1
Besancon	20.8	287	—	—	—	—	13.7	—
De Bilt	E. 21.4	300	4 55	-3	8 46	-7	e 13.6	14.1
	N. 21.4	300	—	—	—	—	e 11.3	12.8
Uccle	21.8	297	e 4 57	-6	e 8 51	-10	e 11.2	—
Paris	23.0	292	—	—	—	—	e 13.7	15.7
Algiers	26.0	263	—	—	—	—	15.2	—
Edinburgh	26.8	308	—	—	—	—	—	19.2
Rio Tinto	32.4	271	21 10	?L	—	—	(21.2)	22.7
Coimbra	32.7	278	21 40	?L	—	—	27.5	28.1

Additional records: Helwan gives its two readings as PN and PE. Hamburg gives MN = +14.7m. De Bilt $T_0 = 21h.42m.16s$. Besancon gives its record one hour late.

Dec. 25d. Records also at 14h. (Batavia and Helwan), 16h. (La Paz), 18h. and 21h. (Taihoku).

Dec. 26d. Records at 0h. (San Fernando), 2h. (Helwan), 5h. (La Paz), 7h. (Taihoku), 14h. (La Paz), 16h. (Apia, Sydney, Victoria, and Adelaide), 17h. (Helwan, San Fernando, Toronto, Uccle, De Bilt, and Chicago), 20h. (La Paz), 21h. (Helwan).

Dec. 27d. Records at 8h. (Bidston), 15h. (Tokyo), 19h. (Taihoku, Manila, and La Paz), 20h. (La Paz, Apia, Sydney, and Helwan), 21h. (Chicago), 23h. (Tokyo).

Dec. 28d. Records at 0h. (San Fernando), 1h. (Mendoza), 2h. (Tokyo), 7h. (Manila), 13h. (Helwan), 14h. (Azores), 18h. (La Paz and Mendoza), 19h. (Helwan), 21h. (La Paz).

Dec. 29d. Records at 0h. (La Paz), 5h. (De Bilt), 9h. (Batavia), 13h. (Manila), 16h. (Moncalieri), 18h. (Manila).

Dec. 30d. Records at 0h. (Algiers), 1h. (Manila), 2h. (Rocca di Papa and La Paz), 3h. (La Paz), 10h. (Melbourne), 11h. (Helwan), 13h. (La Paz).

Dec. 31d. Records at 14h. (La Paz), 18h. (Mizusawa), 21h. (La Paz), 22h. (Taihoku).

B

The International Seismological Summary for 1920 January, February, March.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number opens the third year of the Summary in its new international form. A general discussion on its arrangement has been suggested for the forthcoming international assembly at Madrid in October, 1924, so that it may be convenient to review here the chief points of procedure in forming the Summary, as experience has gradually moulded them.

I.—The Cards.

Information sent from the observing stations is entered on cards. At first all information from a single station for a single day was entered on a single card, but this was found to be inconvenient, and ultimately a separate card was assigned to each clearly independent shock. This is a little extravagant, and possibly a further change in the direction of using a card for information from different stations which all relates clearly to the same shock may be made. But at present this has not been tried. In fact, it has been the general practice to utilize the rest of the card (especially the back) for computing information relating to the station, which has its name printed on the card, as also the constants a , b , c attaching to the station. But two circumstances affected this procedure in practice.

(a) Sometimes after adopting an epicentre the study of the residuals suggests a change, so that the computations on the card no longer apply.

(b) Sometimes an old epicentre is adopted, in which case the computations are not needed.

For these and other reasons computation on the back of the card has fallen into desuetude ; so that there is plenty of room on the card for other uses. The precise use of the cards is, however, a practical detail which does not seriously affect the printing of the Bulletin.

II.—Card Compartments.

The cards are then arranged in compartments under each day. There are four upright chests of drawers, each assigned to a year's records. At present 1919 has been printed off, so that the first chest contains the records for 1920, the other three containing 1921, 1922, and 1923. [Records for 1924 are being collected in a set of 12 separate boxes recently made.] If arrears are caught up sufficiently to set free one of these chests, it will be used for one of the earlier years, not yet dealt with in the modern fashion. The most pressing case is that of 1912, in which there are some good records, though the material is so scanty that after some trials the systematic attack on it was abandoned in favour of 1914. This was at a time when the work was quite new to us, and it was desirable to have plenty of good material. But, subsequently, 1913 was partially dealt with (the "Large Earthquakes of 1913") and our greater experience may enable us now to deal with 1912 (and even earlier years) on a modern footing.

In each yearly chest there are 12 drawers, each devoted to one month, and each drawer is divided into 32 compartments (numbered for the days of the month, with one or two to spare) to receive the cards.

III.—Adopted Tables for P and S: Depth of Focus.

This practically collects together all the information referring to each shock. The next step is to deduce the values of T_0 from the observations of P and S by use of the adopted tables. These tables are only a first approximation, and it has long been hoped to propose corrections to them, but after several abortive trials the hope of doing so at an early date was abandoned, when it was discovered that there were serious differences in the depth of focus at which a shock might take place. Evidence at that time available in support of this view was collected in the Geophysical Supplement to the Monthly Notices R. Ast. Soc., Vol. I, No. 1., and a few copies of this paper were distributed at the first seismological gathering in Rome in 1922. Since then much more evidence has been accumulated. It may be convenient to have a list of the dates so far obtained when there was exceptional depth of focus: The great majority of shocks are at a normal depth which we *suspect* (it cannot be called yet more than a suspicion) to be about 0.040 of the earth's radius below the surface. There is, however, a smaller Group I, when the depth is believed to be less than this normal depth (whatever it is) by the following fractions of the earth's radius:—

GROUP I.

Date	Defect	Date	Defect	Date	Defect
1914 June 26	-010	1918 July 8	-010	1919 April 30	-015
1916 Jan. 1	-009	1918 Sept. 7	-030	1919 May 6	-030
1916 Oct. 3	-021	1918 Sept. 8		1919 May 29	-020
1916 Oct. 20	-021	1918 Sept. 12		1919 Oct. 12	-020

1917 May 1 and June 13 have been omitted on revision.

It will be seen that there are a few cases of defect by $\cdot030$; so that if we admit these as approximately correct, the normal depth must exceed $0\cdot030$; $0\cdot040$ becomes accordingly a reasonable estimate for the great majority (Group II) at normal depth. Below this group comes Group III, as below.

GROUP III.

Date	Excess	Date	Excess	Date	Excess
1913 Nov. 10	+033	1918 Nov. 18	+030	1919 Mar. 16	+015
1914 Feb. 26	+053	1918 Nov. 23	+030	1919 Mar. 16	+010
1915 Jan. 5	+034	1918 Dec. 14	+030	1919 Apr. 17	+010
1916 June 21	+060	1918 Dec. 25	+070	1919 May 3	+005
1916 Sept. 3	+035	1919 Jan. 1	+030	1919 June 1	+040
1917 April 21	+033	1919 Mar. 1	+030	1919 Aug. 18	+050
1918 Feb. 7	+025	1919 Mar. 2	+020	1919 Aug. 18	+015
1918 April 10	+070	1919 Mar. 2		1919 Oct. 27	+040
1918 May 22	+050	1919 Mar. 9	+070?	1919 Nov. 6	+010
1918 May 25	+015	1919 Mar. 13	+070?	1919 Nov. 20	+040

There are at least two cases in which there is evidence of so great a depth as $\cdot070$ below normal, *i.e.*, at least $\cdot100$ of the radius below the surface. There are also some cases where the suggested depth below normal is small ($\cdot005$ for instance), but where the evidence is so good that the hypothesis has been adventured.

It will thus be clear why the attempt to obtain corrections to the adopted tables has been deferred; for the second approximation should involve some reference to the depth of focus, which, though already declared roughly, is still to be obtained with as great precision as possible. The present tables are constructed on the assumption that the focus lies practically close to the surface. On this assumption Prof. C. G. Knott calculated the paths of the rays, and this work has been used in inferring the depth of focus to which we may take $\cdot040$ as a first approximation. We can already see how the tables should be modified in consequence in a general way. For instance, denoting the epicentre by E, the focus $\cdot040$ below it by F, and an observing station 10° distant from E by X, then the present tables give the time when P is observed at

$$E \text{ as } T_0, \text{ at } X \text{ as } T_0 + 150s.$$

where T_0 is the actual moment of the shock. But suppose the focus were $\cdot040$ lower down still ($\cdot080$ altogether): It was shown

in the paper cited (Geop. Sup. I 1) that the existing tables could be used if we applied a correction to each Δ (distance from epicentre), viz., for E the correction $+1^{\circ}5$ and for X the correction $-0^{\circ}5$, making them $+1^{\circ}5$ and $+9^{\circ}5$ respectively, and now the times would be given by the existing tables as $T_0+23s.$ and $T_0+143s.$, so that the interval falls from 150s. to 120s. If, on the other hand, we suppose a focus $\cdot040$ higher instead of lower, so as to bring it into the surface, then we should reverse these figures. (This is not strictly correct, but will serve for illustration). The effective distances will become $-1^{\circ}5$ and $+10^{\circ}5$, and the times

$$T_0-23s. \text{ and } T_0+157s.,$$

the interval being now 180s.

We see, in fact, that if we assume that the present tables are really applicable to shocks originating $\cdot040$ below the surface, then if we infer from them new tables applicable to surface shocks (such as Professor Knott thought he was dealing with) we must increase the intervals, especially near the epicentre. Applying the above procedure to other distances (and adding 23s. in the fourth line so as to make the epicentre time zero and all the others positive), the figures are :

Δ from Epicentre	0	5	10	15	20	30	60	90
Effective Δ	-1.5	+4.9	10.5	16.0	21.6	32.6	64.6	95.4
P from tables	s. -23	s. +76	s. 157	s. 232	s. 300	s. 413	s. 642	s. 825
23sec. added	0	99	180	255	323	436	665	848
Present tables	0	77	150	219	281	388	612	795
Diff.	0	22	30	36	42	48	53	53

It will be seen that a correction of over 53s. is ultimately needed for P near 90° , but that nearly half of this accrues in the first 5° . The surface velocity is, in fact, considerably decreased.

But so far from this making a difficulty, it removes one. The surface velocity deduced from the Oppau explosion was shown by Dr. Jeffreys and Dr. Wrinch to be much smaller than that assumed in the adopted tables. They find, from consideration of distances up to about 3° from the origin (Geop. Sup. M.N.R.A.S. I 2, p. 16) a velocity of 5.4 km/sec. for P instead of 7.1 km/sec. as shown by the present tables, a decrease in the ratio $5.4/7.1 = 0.76$. The ratio for 5° distance shown above is $77/99 = 0.78$, clearly a ratio of the right order of magnitude. It may be doubted whether the present tables are sufficiently correct in detail to allow of a more precise comparison. But it is also clear that they require drastic revision to represent times from an origin on the surface; followed by the repetition of Prof. Knott's investigation with the revised figures.

One other notable consequence of the proposed revision is its effect on PR and SR. At present the time for PR_1 for $\Delta=60^\circ$ is taken as 2 (P for 30°) = $2 \times 6m.28s. = 12m.56s.$, following P for 60° by $2m.44s.$ But with the revised tables the time for 30° is increased by $48s.$, which is doubled in calculating PR_1 , while the correction for 60° only appears singly. Thus $(PR_1 - P)$ is increased by $96s. - 53s. = 43s.$ Here again this removes instead of introducing a difficulty; for the times observed for PR_1 at large distances from the epicentre are persistently much larger than their calculated values. Since the correction to present tables tends to the constant value $53s.$, the increase in $(PR_1 - P)$ tends also to this value. But this is the increase which would apply when the origin is in the surface, and when the PR_1 ray is consequently made up of two exactly equal arcs; when the focus is below the surface the arcs for PR_1 are no longer equal, and a further correction is needed, which, however, we need not consider here.

The situation is thus as follows: The adopted tables are not applicable to earthquakes originating close to the earth's surface, as was supposed, but neither do most earthquakes originate near the surface, as was supposed. The normal depth at which they originate is about $\cdot040$ radius, the evidence for which is

(a) That in certain cases the origin is $\cdot030$ radius above the normal depth, which must therefore exceed $\cdot030$.

(b) that the recognition of this normal depth, and the consequent correction of the tables which were constructed to suit it, immediately removes the difficulty about the surface velocity, which, as deduced from the Oppau explosion, was sensibly less than the tables assigned.

(c) That the correction of the tables also reconciles the observations of PR_1 at great distances, formerly in error.

Consequently tables really applicable to surface shocks would be essentially different from those adopted; but since most shocks are not surface shocks the adopted tables suit them fairly well, and may be retained for the present until we are on firm enough ground to undertake the revision. It is only recently that even a rough estimate of the normal depth ($0\cdot040$ radius) has been possible.

IV.—Determination of T_0 from P and S.

Using then the Adopted Tables, the next step is to determine T_0 from as many complete observations of P and S as are available. Thus on 1920 Jan. 4d. 4h. we have among others the following observations of P and S (omitting 4h.).

		P. m. s.	S. m. s.	S—P. m. s.	Δ c	T_0 m. s.
Mobile		e 26 48	i 29 14	2 26	12.5	23 42
Tucson	E.	25 33	29 3	3 30	18.7	21 8
	N.	25 44	29 14	3 30	18.7	21 19
Lawrence		e 26 48	e 30 13	3 25	18.2	22 29
St. Louis		26 51	30 39	3 48	20.6	22 3
Denver		26 0	30 0	4 0	22.0	20 55
Chicago		27 26	31 44	4 18	24.2	21 56
La Paz		e 30 32	e 37 16	6 44	45.2	21 58
Uccle		e 34 37	45 0	10 23	83.4	21 59
Strasbourg		e 34 50	e 45 27	10 37	86.0	21 57

It will be seen that the last four give closely consistent determinations of T_0 , and we may include St. Louis. But the others are discordant, and such discordances are often a source of considerable uncertainty in determining the place of the epicentre.

V.—Determination of Epicentre.

Whenever possible the epicentre is fixed by use of those observations only which give accordant values of T_0 . Using the corresponding observing stations (which are permanently marked on a globe) as centres, arcs of circles are drawn with radii indicated by the S—P differences; the intersections indicate the neighbourhood of the epicentre, which is selected by inspection. But if an old epicentre is close to this spot it is usually adopted for use, in the first instance at any rate, since the former calculations of Δ and Azimuth then become available.

VI.—Calculation of Δ and Azimuth.

Such requisite values of Δ as have not been previously calculated are now found from the formula

$$2 \text{ versin } \Delta = (a-A)^2 + (b-B)^2 + (c-C)^2$$

The quantities a, b, c , are given in a list of observing stations, two editions of which have already been circulated; and A, B, C , are given for each epicentre. A table of $2 \text{ versin } \Delta$ is given in Mon. Not. R.A.S. for May 1915 (75 p. 530).

At first the Azimuths (Z) were *calculated* also, from the formulæ

$$2 \sin \Delta \sin Z = (a-D)^2 + (b-E)^2 + c^2 - 2$$

$$2 \sin \Delta \cos Z = (a-G)^2 + (b-H)^2 + (c-K)^2 - 2$$

—but this involved much work, especially when the position of the epicentre was afterwards revised, and as only an approximate value of the Azimuth is usually required, it has recently been deemed sufficient to read it from the globe, by means of a string and a large circumscribing scale. But in most cases the constants D, E, G, H, K, have still been printed, though they may not have been used, except perhaps for azimuths close to the epicentre.

VII.—Depth of Focus.

In most cases the arcs drawn on the globe intersect in a point or small area, with sufficient precision to indicate that the focal depth is normal. This supposition is not abandoned without strong reasons, which will become clear to anyone who will try to solve the cases in the above list on the ordinary lines. The cases of deeper focus than usual might perhaps be solved on the alternative hypothesis that the first shock took place simultaneously over a large area, so that instead of a single epicentre E, we might adopt a ring of epicentres, of which F and G, say, are in azimuths 0° and 180° . Then stations in azimuth 0° would receive their first news from F, and would all be effectively nearer the epicentre; those in azimuth 180° would receive their first news from G, and would again all be nearer the epicentre. This is, in the main, the phenomenon to be explained, *viz.*, that stations in opposite azimuths both call for the epicentre to be moved nearer to them. But this alternative would supply the same shift to all the stations in the same azimuth, whatever their distance away; whereas the hypothesis of abnormal focal depth graduates the shift according to distance, and is found to fit the facts so well that it is difficult to prefer the constant shift. Moreover, this alternative of a wide area for the shock (supposed always close to the surface) entirely fails to supply any explanation of the cases of “high focus” where all stations call for a displacement of the epicentre *away* from themselves. We should have to suppose that the first news in each case was received, not from the nearest point of the disturbed area, but from that farthest away.

Briefly, it is claimed that the hypothesis of a variation in focal depth at present holds the field; it explains the facts so far as they have been tested; and evidence in its favour is steadily accumulating.

VIII.—The Printed Results: Headings.

Explanation has now been given of the methods used for determining the elements printed at the heading of each earthquake; *viz.*, the time T_0 of occurrence (in Greenwich time reckoned from midnight) the position of the epicentre (δ =latitude λ =longitude reckoned E and W from Greenwich), and the depth

of focus, in fractions of the earth's radius measured from the normal or average depth. This last is believed to be about 0.040 below the surface, but as yet no use has been made of this assumption in the calculations. Next follow the constants

$$A = \cos \delta \cos \lambda, B = \cos \delta \sin \lambda, C = \sin \delta$$

where δ is the north latitude, and λ the E longitude from Greenwich. These are used in calculating the distance Δ of the epicentre from any station by the formula

$$2 \text{ versin } \Delta = (a - A)^2 + (b - B)^2 + (c - C)^2$$

The distance Δ is always given in degrees so that it may be readily used on any artificial globe. There has been an unfortunate practice of measuring Δ in kilometres, which must be converted into arc before use either on a globe or for calculation. It is to be hoped that this superfluous complication will fall into disuse.

The constants D, E ; and G, H, K, are for use in finding the azimuth of the *station from the epicentre*, measured from 0° in the N., through E (90°) S. (180°) W. (270°) to N again. These azimuths are, of course, entirely different from those of the *epicentre from the station*, which can be found from the component seismographs, and may be used in determining the epicentre from observations at a single station. The value of such azimuthal specifications for an independent determination of the epicentre by azimuths alone, without any reference to tables of distance, was pointed out by Galitzin and Walker ; and this method would be specially valuable in the cases of alleged abnormal focus, for obvious reasons. But as yet such azimuthal determinations have not been generally made. They require a complete equipment of two horizontal components and a vertical. The last is chiefly useful in electing between opposite azimuths, and might be dispensed with when the epicentre is approximately known. But it is high time to inquire whether those stations possessing two similar horizontal components could not give good indications of the azimuth of the epicentre, which might be used to check the determinations made by means of times of arrival of P and S.

To return, however, to the *other* azimuths—those of the *stations from the epicentre*. These are chiefly useful in estimating suitable displacements of the adopted epicentre as shown by the residuals, or rather by the time-residuals when converted into equivalents in Δ . The effect of a displacement of the epicentre, say p° in azimuth Z_0 is approximately

$$\begin{aligned} p \cos (Z - Z_0) &= (p \sin Z_0) \sin Z + (p \cos Z_0) \cos Z \\ &= x \sin Z + y \cos Z \text{ say.} \end{aligned}$$

Hence x and y are readily determined from a number of linear equations. This formula is, however, only correct when p is quite small, so that a second approximation is sometimes necessary.

Another advantage of having the azimuth Z (even when roughly indicated) before the eyes is that it can often be seen by inspection in which direction displacement of the epicentre is called for ; and cases of abnormal focus can often be detected from the incompatible calls in opposite azimuths.

IX.—The Separate Columns.

Coming now to the separate columns, the following points may be noticed :—

(a) When different readings are given by two components, or two machines, they are sometimes printed separately, the component being specified in the first column. Often, however, the agreement is so close that separate printing seems needless. Or the differences may be chiefly in L and M ; in which case *the results for the E component are printed throughout in the text*, those for the N component being added in the Notes at the end.

(b) In the earlier numbers of the Summary (and in the Bulletin which preceded it) a column was devoted to the nature of the seismograph. But it was found difficult to achieve accuracy in this column. The seismograph was often not specified at an observatory where there was known to be more than one, and it was often difficult to recover the date of change, when it was known that a better machine had been substituted. Hence, although there are undoubted differences between the records of different machines (See B.A. Report for 1917 Table III) this column was dropped as involving more work than seemed proportionate to its value. If any question turns on the particular machine used, reference can be made to the information supplied from the observatory.

(c) The columns of Δ (Distance) and Z (Azimuth) have perhaps been sufficiently explained above. Δ is calculated to $0^{\circ}1$; Z is now generally read from a globe, and may be in error by 1° or 2° .

(d) The columns for P and S represent the excesses of the observed times over T_0 , the adopted time of the shock. In the early years the times themselves were printed, as they could more readily be checked with the originals ; but experience showed the great advantage of subtracting T_0 so that the times of transmission may be readily compared with tables, or with those of another

similar earthquake. Comparisons with the adopted tables are given in the columns O—C, and require little comment for $\Delta < 90^\circ$. But when Δ exceeds 90° the records of P and S become ambiguous, and seldom accord with the tables. Two other phenomena are frequently observed instead of P; the most easily recognised is PR_1 , the first reflected wave. But (especially near the anticentre) the wave denoted [P], which reaches the anticentre in about 20m.17s., is often observed. The formula given for it is

$$20\text{m.}17\text{s.} - (180 - \Delta)^2 \times 0.0235\text{s.}$$

which was deduced from records between $\Delta = 130^\circ$ and $\Delta = 180^\circ$. If it may be carried back to 90° it would be related to PR_1 (assuming the adopted tables correct for a surface shock so that the time for PR_1 at Δ is just double the time for P at $\Delta/2$) as follows:—

Δ °	PR_1 m. s.	[P] m. s.	Δ °	PR_1 m. s.	[P] m. s.	Δ °	PR_1 m. s.	[P] m. s.
90	17 6	17 7	120	20 24	18 52	150	23 38	19 56
100	18 14	17 47	130	21 30	19 18	160	24 38	20 8
110	19 18	18 22	140	22 34	19 39	170	25 36	20 15

whence it will be seen that near $\Delta = 90^\circ$ there are difficulties in separating the two phenomena, which, however, disappear as Δ increases.

There are similarly SR_1 and [S] (though the latter has not yet been definitely reduced to tables), and generally the number of alternatives for S is larger still. Some of them were briefly indicated in the Introduction to the “Large Earthquakes of 1913,” p. vii, but a much larger collection can now be made, which it is hoped to undertake shortly.

(e) The columns for L and M are given to 0.1m. only, as they are often very rough. Different trains of waves are undoubtedly represented in this part of the seismogram, to some of which Dr. Jeans and Dr. Jeffreys have already called attention, and it is doubtful whether any precise meaning can be given, even to the first appearance of L; but the rough rule—

$$2 \text{ (L in minutes)} = \Delta \text{ in degrees}$$

—gives fair results. Near the anticentre it seems that L may represent a long wave starting from the anticentre on the receipt of [P], *i.e.* 20m.17s. after T_0 , and this has sometimes been noted as [L].

In the neighbourhood of the epicentre an approximate value of T_0 for a small shock can sometimes be inferred from the formula

$$(P - T_0) = 0.4 (M - P)$$

(f) In the notes are given (as above mentioned) additional records from N components which differ sensibly from E records

printed in the text. Such abbreviations as LN or MN, meaning the L or M observation by the N component, scarcely require explanation.

The above is a general summary of the points on which a reminder, or a new comment, may be useful, in reference to the Summary as a whole.

As regards the present number attention may be called to the cases of abnormal focus below :—

	T ₀ (1920)				Epicentre		Depth below normal
	d.	h.	m.	s.	°	°	
Jan.	20	1	42	5	8·0S.	127·5E.	+·030?
Feb.	22	17	35	40	46·7N.	145·8E.	+·050
Feb.	26	1	26	0	5·0N.	110·0E.	+·050
Mar.	3	10	43	25	8·0S.	127·5E.	+·030?
Mar.	15	12	5	30	20·0S.	176·5E.	+·030
Mar.	22	20	1	43	17·0S.	177·5W.	+·040

In the last number of the Summary a new and surprising feature of the 21min. period was mentioned. There seems good evidence that it is controlled by the Moon, but the work of verifying this hypothesis in detail is laborious, and is not yet completed.

It is very pleasant to note that the Seismological Service at Pulkovo has been restored. Records have been received for the months 1923 June to 1924 January. We have previously had records from Ekaterinburg.

H. H. TURNER.

University Observatory, Oxford,
1924 July 16.

1920 JANUARY, FEBRUARY, & MARCH.

Jan. 1d. 12h. 7m. 0s. Epicentre $18^{\circ}0'S$, $173^{\circ}5'E$.A = -·945, B = +·108, C = -·309; D = +·113, E = +·994;
G = +·307, H = -·035, K = -·951.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	14·8	76	e 3 44	+ 8	—	—	4·0	—
Riverview	25·5	227	e 5 42	- 1	e 10 10	- 3	e 12·7	18·2
Sydney	25·5	227	5 0	-43	—	—	12·8	16·5
Christchurch	25·6	181	14 18	?L	—	—	17·2	18·1
Melbourne	31·8	227	—	—	12 0	- 5	19·1	21·9
Adelaide	35·3	234	—	—	—	—	15·4	24·4
Honolulu	48·3	39	14 42	?S	(14 42)	-76	27·5	39·7
Manila	61·2	299	e 11 0	+40	—	—	—	—
Batavia	65·9	273	9 30	-80	e 19 44	+ 8	42·2	21·2
Victoria	87·0	37	—	—	—	—	39·1	44·0
Chicago	108·4	51	—	—	—	—	52·0	—
La Paz	110·2	118	e 11 34	? e 23 4	?PR ₁	—	46·0	54·8
Toronto	114·6	49	—	—	—	—	54·8	63·5
Cape Town	122·9	208	66 24	?L	—	—	(66·4)	82·4
De Bilt	144·7	348	—	—	—	—	81·0	116·0
Helwan	144·2	297	31 18	?S	—	—	—	115·7
	144·2	297	34 24	?	—	—	—	116·2
Uccle	146·1	349	—	—	—	—	83·0	—
Moncalieri	150·5	340	—	—	—	—	92·4	—
Coimbra	157·7	4	—	—	e 81 0	?L	104·2	106·1
San Fernando	161·2	359	86 24	?L	—	—	(86·4)	116·0

Additional records: Riverview gives also eP = +6m.7s., SR₁ = +11m.54s.,
 MN = +15·5m., MZ = +16·4m. Melbourne PR₂ = +7m.18s., SR₁ =
 +15m.12s., SR₂ = +16m.6s. Christchurch gives records also at +14m.36s.
 and +16m.12s. Batavia L = +48·2m. and +52·2m. Chicago L =
 +61·0m. Toronto eL = +59·4m. and L = +66·5m. De Bilt eN =
 +83·0m., MN = +112·2m. Coimbra probably records some other shock.
 Moncalieri e = +36m.33s. Perth gives from 12h.24m. to 14h.32m.30s.

Jan. 1d. Records also at 1h. (La Paz), 2h. (Lick, Point Loma, Berkeley, Tucson, and Victoria), 3h. (Christchurch and Riverview), 8h. (La Paz), 9h. (La Paz and Apia), 15h. (La Paz, Apia, Riverview, Sydney, and Honolulu), 16h. (Adelaide, Toronto, Chicago, and Helwan), 17h. (San Fernando), 18h. (Riverview), 19h. (Helwan), 20h. (Uccle).

Jan. 2d. 13h. 17m. 15s. Epicentre $46^{\circ}0'N$, $130^{\circ}0'W$. (as on 1918 Oct. 15d.).

A = -·447, B = -·532, C = +·719.

	Δ °	P. m. s.	O-C. s.	L. m.	M. m.
Victoria	5·2	3 20	+120	4·8	5·3
	z. 5·2	2 55	+95	4·1	5·7
Berkeley	9·9	e 2 28	- 1	e 4·2	5·9
Lick	10·6	e 2 38	0	e 4·5	—
Honolulu	33·6	—	—	e 16·1	19·9
Ithaca	37·8	—	—	e 20·9	—

Berkeley gives also MN = +7·3m., T₀ = 13h.18m.4s.

Jan. 2d. Records also at 8h. and 9h. (Taihoku), 15h. (near La Paz; and San Fernando), 16h. (Batavia), 22h. (La Paz).

Jan. 3d. 0h. 51m. 28s. Epicentre $40^{\circ}0'N$, $141^{\circ}5'E$.

A = -·600, B = +·477, C = +·643.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mizusawa	0·9	0 14	0	0 25	0	—	—
Tokyo	4·6	2 6	?S	(2 6)	0	3·9	—
Osaka	7·2	1 35	-14	—	—	2·9	4·6
Zi-ka-wei	18·5	3 48	-35	—	—	—	—
La Paz	145·2	19 34	[-14]	—	—	—	—

Osaka gives MN = +4·2m.

Jan. 3d. Records also at 1h. (Tacubaya), 6h. (Harvard and Taihoku), 8h. (Osaka and Mizusawa), 9h. (La Paz), 12h. (Manila), 13h. (San Fernando), 15h. (Mizusawa), 18h. (Algiers), 19h. (Helwan), 22h. (Lick).

Jan. 4d. 4h. 21m. 58s. Epicentre $18^{\circ}2'N$. $97^{\circ}5'W$.

A = -124 , B = -942 , C = $+312$; D = -991 , E = $+130$;
G = -041 , H = -309 , K = -950 .

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Oaxaca		1.3	141	0 29	+ 9	—	—	1.0	1.2
Tacubaya	E.	1.4	307	2 52	?	—	—	3.3	3.6
	N.	1.4	307	2 53	?	—	—	3.3	3.5
	Z.	1.4	307	2 51	?	—	—	3.3	3.4
Mazatlan	E.	9.7	302	2 33	+ 7	—	—	5.1	5.4
Mobile		15.0	32	e 4 50	+71	i 7 16	?L (i 7.3)	7.3	7.3
Tucson	E.	18.5	322	3 35	-48	7 5	-46	9.0	11.3
	N.	18.5	322	3 46	-37	7 16	-35	9.0	11.1
Lawrence		20.9	5	e 4 50	- 2	e 8 15	-27	11.2	16.0
St. Louis		21.4	16	4 53	- 5	8 41	-12	—	15.5
Denver		22.5	345	4 2	-69	8 2	-73	13.0	14.5
Chicago		25.0	18	5 28	-10	9 46	-17	11.9	—
Ann Arbor	E.	26.8	23	5 32	-24	10 14	-23	13.5	18.5
	N.	26.8	23	5 44	-12	10 8	-29	—	18.0
Cheltenham	E.	27.3	37	5 39	-22	10 38	- 8	—	20.9
	N.	27.3	37	5 46	-15	10 25	-21	16.8	20.5
Georgetown	E.	27.3	36	e 5 55	- 6	10 54	+ 8	e 13.3	—
	N.	27.3	36	e 5 55	- 6	10 48	+ 2	—	—
Washington		27.3	36	6 2	+ 1	10 42	- 4	(12.0)	—
Lick		28.5	317	e 7 10	?PR ₁	—	—	—	19.0
Berkeley	E.	29.3	317	e 6 24	+ 3	e 11 13	- 9	—	19.9
	N.	29.3	317	e 6 20	- 1	e 11 15	- 7	e 14.1	20.0
Toronto		29.7	27	6 50	+25	11 2	-27	19.9	25.8
Ithaca		30.1	33	6 18	-11	11 11	-25	13.0	—
Vieques	E.	30.4	84	6 34	+ 2	—	—	14.9	—
Ottawa		32.7	30	e 6 41	-13	e 11 54	-25	e 15.7	—
Harvard	E.	33.0	38	e 6 39	-17	11 58	-26	—	24.7
	N.	33.0	38	e 6 42	-14	11 58	-26	e 15.2	—
Northfield		33.3	34	—	—	—	—	e 23.0	—
Victoria		36.7	331	8 31	+63	12 27	-53	18.8	25.7
	Z.	36.7	331	7 27	- 1	12 22	-58	21.5	25.8
La Paz		45.1	140	e 8 34	0	e 15 18	+ 2	22.8	25.7
Honolulu		56.7	284	—	—	17 38	- 4	28.0	32.5
Eskdalemuir		77.5	36	21 48	?S	(21 48)	- 7	38.0	—
Edinburgh		78.1	36	—	—	—	—	—	46.7
Rio Tinto		79.6	126	15 2	?PR ₁	—	—	—	66.0
Oxford		79.6	40	—	—	—	—	45.8	—
Kew		80.2	40	—	—	—	—	—	60.0
San Fernando		80.3	55	—	—	—	—	42.8	46.5
Paris		82.8	41	—	—	—	—	e 43.0	54.0
De Bilt		83.2	38	—	—	e 23 7	+ 8	e 42.0	51.8
Uccle		83.2	39	e 12 39	+ 2	23 2	+ 3	e 39.0	—
Hamburg		85.4	35	e 12 51	+ 1	—	—	e 45.0	—
Strasbourg		86.1	40	e 12 52	- 2	e 23 29	- 2	50.0	—
Algiers		87.3	51	—	—	23 31	-13	50.0	57.5
Moncalieri		87.5	43	23 26	?S	(23 26)	-21	43.8	62.1
Helwan		111.2	47	28 2	?S	(28 2)	+23	—	—
Riverview		117.4	241	e 16 3	+32	—	—	e 58.0	63.9
Melbourne		122.6	236	—	—	—	—	e 62.0	68.0

Additional records: Mazatlan gives PZ = +2m.33s., MN = +5.4m., MZ = +6.0m. Denver MN = +13.0. No seconds are recorded for any of these records. Ann Arbor (Wiechert) PN = +5m.44s., SN = +10m.32s. Cheltenham ME is increased by 10m. Washington gives a second set of PSL, P = +12m.2s., S = +17m.7s., eL = 18.0m. Berkeley ePV = +6m.18s., MV = +19.7m. Toronto P = +5m.38s., L = +21.4m., eL = +22.8m., and +29.3m. Ithaca eN = +12m.2s., e = +13m.14s., LN = +19.1m. Vieques PN = +6m.47s. Ottawa L = +23.0m., and +33.0m., T₀ = 4h.22m.3s. Harvard iE = +6m.47s., iN = +6m.51s., T₀ = 4h.21m.44s. Victoria iL = +23.7m. La Paz iP = +8m.45s., i = +11m.18s., iS = +15m.40s. Honolulu SR₁ = +23m.50s. Helwan gives PN = +29m.2s. Eskdalemuir iN = +30m.36s. De Bilt MN = +47.1m. Riverview cPS? = +30m.8s., MN = +69.4m.

Jan. 4d. Records also at 5h. (2) and 6h. (2) (near Tacubaya), 7h. (Tacubaya and La Paz), 8h. (Tacubaya (2) and La Paz), 9h. (La Paz), 10h. (Tacubaya (2)), 13h. (Tacubaya), 16h. and 17h. (2) (near Athens), 18h. (near Tacubaya, Oaxaca, and Athens), 21h. (La Paz).

Jan. 5d. Records at 3h. (Manila (2) and near Athens), 4h. (near La Paz), 5h. (Riverview), 8h. (near Tokyo), 12h., 14h., 20h., 22h. (San Fernando), 23h. (Athens (2)).

Jan. 6d. 3h. 50m. 32s. Epicentre $40^{\circ}0'N$, $141^{\circ}5'E$. (as on Jan. 3d.).

$$A = -600, B = +477, C = +643.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Mizusawa	0.9	0 13	- 1	0 26	+ 1	—	—
Tokyo	4.6	1 13	+ 2	—	—	1.8	2.1
Osaka	7.2	1 48	- 1	—	—	2.8	3.8
De Bilt	80.4	—	—	—	—	e 48.5	49.5

Mizusawa gives SN = +27s. De Bilt MN = +52.1m.

Jan. 6d. Records also at 3h. (Manila), 4h. (near Tacubaya), 5h. (Batavia), 10h. (Apia), 11h. (near Mizusawa), 12h. (Tokyo), 13h. and 14h. (Mizusawa), 20h. (San Fernando).

Jan. 7d. Records at 1h. (Mizusawa, San Fernando, and La Paz), 8h. (Rocca di Papa and Helwan), 9h. (La Paz, Victoria, Monte Cassino, and Honolulu), 10h. (Taihoku), 15h. (Tacubaya and La Paz), 16h. (Tokyo and Mizusawa (2)), 17h. (Mizusawa and Tokyo), 20h. (Taihoku and San Fernando), 21h. and 22h. (near La Paz).

Jan. 8d. Records at 0h. (San Fernando), 1h. (La Paz), 2h. (Helwan), 3h. and 6h. (La Paz), 8h. (Helwan), 9h. (Batavia, Colombo, and Kodaikanal).

Jan. 9d. 11h. 58m. 57s. Epicentre $43^{\circ}2'N$, $29^{\circ}3'E$.

$$A = +636, B = +357, C = +684; \quad D = +489, E = -872; \\ G = +597, H = +335, K = -729.$$

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Lemberg	7.6	333	3 57	?L	5 9	?	(4.0)	6.4
Vienna	10.3	304	e 2 36	+ 2	e 4 40	+ 3	e 5.6	—
Pola	11.2	284	e 5 10	?S	(e 5 10)	+11	e 5.6	6.0
Padova	12.7	286	5 31	?S	(5 31)	- 6	—	7.7
Helwan	13.4	172	7 3	?L	—	—	(8.0)	—
Moncalieri	15.6	284	4 29	+42	6 38	- 8	8.6	11.8
Strasbourg	15.9	297	e 1 3	?	—	—	8.0	—
Hamburg	16.4	316	—	—	—	—	e 9.2	—
Besancon	16.8	292	—	—	—	—	9.0	—
De Bilt	18.5	307	—	—	—	—	e 9.4	10.6
Uccle	18.5	304	—	—	—	—	e 9.0	—
Paris	19.3	296	—	—	—	—	9.0	—
Mizusawa	77.2	48	—	—	—	—	57.6	—

Pola gives MN = +5.9m. Moncalieri MN = +11.2m.

Jan. 9d. Records also at 1h. (San Fernando), 2h. (near La Paz), 4h. (Kodaikanal and Mazatlan), 9h. (Lick and Colombo), 10h. (near Athens), 16h. (La Paz and Balboa Heights), 22h. (Apia and Taihoku).

Jan. 10d. Records at 1h. (Batavia), 3h. (San Fernando), 6h. and 9h. (near Mizusawa), 10h. (La Paz), 11h. (Apia), 18h. (Azores and Batavia), 23h. (San Fernando).

Jan. 11d. Records at 0h. (La Paz), 2h. (Riverview and Adelaide), 3h. (Church and Melbourne), 4h. (Helwan), 5h. (La Paz), 10h. (Helwan), 11h. (Mizusawa), 12h. (La Paz), 13h. (Lick and La Paz), 15h. (near Mizusawa, Tokyo (2), and Osaka (2)), 16h. (La Paz), 18h. (Helwan), 23h. (La Paz and near Zurich).

Jan. 12d. 2h. 52m. 20s. Epicentre $18^{\circ}0'N$, $133^{\circ}0'E$. (as on 1919 Sept. 5d.).

$$A = -.649, B = +.696, C = +.309; \quad D = +.731, E = +.682;$$

$$G = -.211, H = +.226, K = -.951.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	12.1	256	e 2 47	-13	—	—	3.5	3.9
Batavia	35.4	229	e 7 17	0	e 13 0	-1	—	14.0
Colombo	52.9	267	29 40	?L	—	—	(29.7)	—
Helwan	90.8	301	59 40	?L	—	—	(59.7)	—
La Paz	159.8	89	22 10	?PR ₁	—	—	—	—

Additional records: Manila gives MN = +4.1m. Helwan PN = +60m.40s.

Jan. 12d. 13h. 39m. 52s. Epicentre $22^{\circ}3'N$, $143^{\circ}2'E$.

$$A = -.741, B = +.554, C = +.380; \quad D = +.599, E = -.801.$$

$$G = -.304, H = +.227, K = -.925.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	13.7	348	6 24	?S	(6 24)	+23	8.7	11.9
Osaka	14.1	333	3 40	+13	—	—	—	12.1
Mizusawa	16.9	355	3 48	-16	—	—	10.4	—
Taihoku	20.0	281	5 12	+31	8 37	+14	11.0	15.3
Zi-ka-wei	21.3	299	e 4 54	-3	e 8 51	+1	—	13.9
Manila	22.5	254	e 5 54	+43	9 57	+42	11.7	12.3
Ootomari	24.3	359	e 4 34	-57	—	—	6.8	9.6
Batavia	45.6	236	8 37	0	i 15 19	-3	—	19.1
Honolulu	54.2	79	—	—	22 32	?SR ₁	26.7	37.8
Riverview	56.7	171	e 9 51	+1	e 17 42	0	26.5	31.4
Adelaide	57.5	184	—	—	—	—	—	36.1
Simla	58.8	293	e 17 44	?S	(e 17 44)	-25	—	18.0
Melbourne	60.2	179	—	—	—	—	36.4	37.6
Colombo	62.8	267	21 8	?SR ₁	—	—	—	46.6
Kodaikanal	63.9	271	37 32	?L	—	—	(37.5)	—
Victoria	75.7	43	20 58	?S	(20 58)	-36	32.8	38.7
Berkeley	79.8	52	—	—	—	—	e 34.7	—
Hamburg	94.0	334	—	—	—	—	e 51.1	60.1
Helwan	96.4	306	—	—	25 8	-12	—	—
De Bilt	97.0	336	—	—	—	—	e 51.1	65.9
Uccle	98.4	335	—	—	—	—	e 49.1	—
Strasbourg	98.7	330	—	—	—	—	—	61.1
Rocca di Papa	101.3	324	—	—	—	—	e 63.4	65.9
Moncalieri	101.5	330	e 15 44	+86	—	—	52.1	—
Toronto	103.3	30	—	—	—	—	59.2	66.6
Coimbra	112.0	337	—	—	—	—	e 56.6	—
La Paz	149.9	85	46 17	?SR ₁	—	—	—	—

Additional records: Osaka gives MN = +11.8m. Manila MN = +12.0m. Ootomari MN = +9.4m. Honolulu PR₁ = +17m.50s. Riverview MN = +30.5m. Victoria S = +26m.23s. (?SR₁). Hamburg MZ = +63.1m., MN = +67.1m. Helwan +26m.8s. Toronto eL = +64.3m.

Jan. 12d. Records also at 3h. (Manila), 4h. (San Fernando), 10h. (Colombo), 12h. (La Paz and Batavia), 13h. (Kobe), 14h. (Pola, Toronto, San Fernando, and Batavia), 15h. (Rio de Janeiro and La Paz), 16h. (Coimbra, Batavia, and Port au Prince), 19h. (La Paz), 23h. (Tucson and near Tokyo).

Jan. 13d. 18h. 30m. 40s. Epicentre $40^{\circ}3'N$. $139^{\circ}5'E$. (as on 1918 Sept. 13d.).

$$A = -\cdot580, B = +\cdot495, C = +\cdot647; \quad D = +\cdot649, E = +\cdot760; \\ G = -\cdot492, H = +\cdot420, K = -\cdot763.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	1-7	133	0 36	+10	0 47	- 1	—	—
	N.	1-7	133	0 34	+ 8	0 49	+ 1	—	—
Tokyo		4-7	178	1 41	+28	—	—	2-6	3-5
Osaka		6-5	212	e 1 53	+14	—	—	—	4-5
Kobe		6-6	213	1 51	+10	—	—	3-7	4-5
Ootomari		6-8	19	0 43	-61	—	—	2-9	4-7
Zi-ka-wei		17-2	244	e 3 54	-13	—	—	—	—
Taihoku		21-4	230	—	—	—	—	e 10-3	—
De Bilt		79-6	333	—	—	—	—	e 44-3	49-4
Uccle		80-8	333	—	—	—	—	e 43-3	—
Helwan		83-4	304	52 20	?L	—	—	(52-3)	—
Moncalieri		84-4	328	—	—	—	—	46-7	—
San Fernando	E.	97-1	332	55 50	?L	—	—	(55-8)	59-3
	N.	97-1	332	55 20	?L	—	—	(55-3)	62-3
La Paz		146-2	52	19 49	[- 1]	—	—	—	—

Additional records: Kobe gives MN = +4-3m. Ootomari MN = +6-6m.
De Bilt MN = +50-4m. Helwan PN = +54m.20s. Moncalieri e = +35m.15s. San Fernando gives its M as at 12h., not at 19h.

Jan. 13d. 23h. 0m. 28s. Epicentre $9^{\circ}5'S$. $157^{\circ}0'E$.

$$A = -\cdot908, B = +\cdot385, C = -\cdot165; \quad D = +\cdot391, E = +\cdot920; \\ G = +\cdot152, H = +\cdot064, K = -\cdot986.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview		24-9	191	e 5 37	0	i 10 1	0	e 12-8	14-8
Sydney		24-9	191	10 20	?S	(10 20)	+19	14-9	15-7
Melbourne		30-3	199	12 26	?S	(12 26)	+47	16-2	19-1
Adelaide		30-5	210	6 20	-13	11 32	-11	16-0	19-4
Perth		44-2	234	—	—	15 2	- 3	—	—
Taihoku		48-9	317	e 9 12	+13	—	—	—	—
Nagano		49-4	340	e 8 5	-58	—	—	—	—
Batavia		49-7	273	e 9 6	+ 1	i 16 12	- 3	—	20-2
Zi-ka-wei		53-1	322	e 8 56	-31	—	—	—	—
Honolulu		53-8	55	e 9 44	+12	—	—	23-1	34-1
Victoria		90-4	40	23 4	?S	(23 4)	-74	39-8	45-3
Chicago		115-2	48	—	—	—	—	55-5	—
Toronto		120-5	44	27 2	?S	(27 2)	-111	53-5	73-0
Cape Town		121-4	220	65 26	?L	—	—	(65-4)	72-9
Helwan		125-6	299	40 32	?SR ₁	—	—	—	—
Harvard		126-7	42	—	—	—	—	67-1	—
La Paz		128-3	121	i 28 28	?S	(i 28 28)	-81	62-6	96-2
De Bilt		131-6	336	—	—	e 22 26	?PR ₁	64-5	76-6
Uccle		133-0	336	e 22 32	?PR ₁	—	—	e 63-5	73-5
Strasbourg		133-2	331	e 18 32	[-54]	—	—	—	78-5
Rocca di Papa		135-1	321	i 19 3	[-27]	—	—	83-8	—
Paris		135-3	336	—	—	—	—	76-5	81-5
Moncalieri		135-8	329	—	—	—	—	73-3	83-2
Tortosa		142-4	330	19 24	[-20]	—	—	e 71-5	77-2
Algiers		143-9	322	19 16	[-32]	29 39	?	99-0	105-5
San Fernando		149-0	332	19 51	[- 3]	—	—	90-0	118-5

Additional records: Riverview gives i = +6m.7s., PS = +10m.24s. and +10m.53s., MZ = +15-0m. Melbourne S = +15m.20s. Chicago L = +64-5m. Toronto L = +59-6m., +63-8m., eL = +65-7m. and +80-1m. Helwan PN = +35m.32s. Harvard LN = +83-3m. De Bilt MN = +74-2m. Rocca di Papa LN = +89-4m. Paris eLN = +72-5m. Moncalieri e = +46m.23s. San Fernando MN = +98-0m. Uccle and Riverview give their records on 14d.

Jan. 13d. Records also at 4h. (Mizusawa), 6h. (Batavia), 9h. (Perth), 10h. (Riverview and Rocca di Papa), 11h. (Tacubaya), 14h. (Batavia and Colombo), 15h. (Florence and Helwan), 18h. (Tokyo), 20h. (La Paz), 22h. (La Paz and Mizusawa), 23h. (La Paz).

Jan. 14d. 14h. 38m. 20s. Epicentre $7^{\circ}2'S$. $150^{\circ}0'E$.

A = -859 , B = $+496$, C = -125 ; D = $+500$, E = $+866$;
G = $+108$, H = -063 , K = -992 .

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	26.7	178	e 5 56	+ 1	e 10 36	+ 1	e 14.5	16.7
Sydney	26.7	178	10 52	?S	(10 52)	+17	16.2	17.1
Adelaide	29.7	199	7 16	+51	11 28	- 1	16.7	20.5
Melbourne	31.0	185	—	—	12 40	+49	16.8	21.7
Perth	40.3	229	—	—	14 15	+ 4	—	—
Taihoku	42.4	322	—	—	e 14 23	-17	—	—
Honolulu	58.4	60	e 10 40	+39	18 4	0	27.6	37.8
Berkeley	92.6	52	—	—	—	—	e 42.6	—
Victoria	93.2	42	24 5	?S	(24 5)	-42	40.8	49.2
Helwan	118.4	300	31 40	?	—	—	(50.7)	—
Chicago	118.6	46	—	—	—	—	e 59.2	—
Hamburg	123.5	333	—	—	—	—	e 63.7	—
Toronto	123.6	40	63 28	?L	—	—	(63.5)	76.4
De Bilt	126.7	334	—	—	—	—	e 64.7	68.7
Eskdalemuir	127.4	340	—	—	—	—	65.7	—
Uccle	128.0	332	—	—	—	—	e 35.7	—
Paris	130.2	332	—	—	—	—	e 69.7	78.7
La Paz	135.5	123	23 11	?PR ₁	—	—	84.8	90.1
Algiers	137.9	319	—	—	—	—	e 76.7	84.2
Coimbra	141.7	333	—	—	—	—	e 85.0	—
San Fernando E.	143.7	326	89 40	?L	—	—	(89.7)	93.7
N.	143.7	326	74 40	?L	—	—	(74.7)	92.7

Additional records: Riverview gives PS = $+11m.2s.$ and $+13m.14s.$, MZ = $+17.0m.$, MN = $+17.2m.$ Victoria S = $+29m.59s.$ (?SR₁). Helwan gives its two records as PN and PE. De Bilt MN = $+69.8m.$ Toronto L = $+70.9m.$, eL = $+72.2m.$

Jan. 14d. Records also at 1h. (Toronto), 2h. (Mizusawa (2)), 3h. (Mizusawa), 4h. (Strasbourg), 5h. (Mizusawa), 6h. (Mizusawa and Tokyo), 7h. (Helwan, De Bilt, Zi-ka-wei, La Paz, and Mizusawa), 9h. (Mizusawa), 11h. (Tacubaya), 13h. (Nagasaki), 15h. (Mizusawa (2)), 17h. (Toronto), 18h. (Lick, Moncalieri, and Mizusawa), 19h. (Lick), 20h. (Mizusawa and Manila), 22h. (Rocca di Papa).

Jan. 15d. 11h. 48m. 5s. Epicentre $11^{\circ}5'N$. $144^{\circ}0'E$. (as on 1919 Sept. 11d.).

A = -793 , B = $+576$, C = $+199$; D = $+588$, E = $+809$;
G = -161 , H = $+118$, K = -980 .

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	22.7	280	e 5 29	+16	—	—	—	—
Batavia	41.0	247	e 7 52	-11	—	—	—	—
Riverview	45.8	172	e 15 21	?S	(e 15 21)	- 4	e 23.9	26.2
Perth	51.1	211	—	—	16 25	- 7	—	—
Victoria	83.2	42	—	—	—	—	40.0	44.4
Toronto	112.2	32	—	—	—	—	49.5	61.6
La Paz	148.4	103	19 52	[- 1]	—	—	—	—

Additional records: Riverview gives MN = $+35.1m.$ Toronto L = $+60.0m.$

Jan. 15d. 16h. 25m. 27s. Epicentre $19^{\circ}0'N$. $70^{\circ}0'W$. (as on 1919 Aug. 22d.).

A = $+323$, B = -889 , C = $+326$.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Port au Prince	2.1	e 0 30	- 3	1 2	+ 4	—	1.8
Vieques E.	4.4	1 3	- 5	—	—	1.4	2.1
N.	4.4	1 3	- 5	—	—	1.5	1.9
La Paz	35.6	7 31	+13	—	—	—	—
De Bilt	66.1	—	—	—	—	e 36.6	—

Port au Prince gives SNW = $+1m.3s.$

Jan. 15d. Records also at 0h. (near Monte Cassino), 1h. (San Fernando and Mizusawa), 2h. (near La Paz), 4h. (near Mizusawa), 5h. (Manila), 9h. (La Paz), 10h. (Florence and Helwan), 12h. (near Mizusawa), 13h. (Denver), 15h. (Nagasaki), 16h. (La Paz).

Jan. 16d. Records at 7h. (Mizusawa, San Fernando, and Zi-ka-wei), 15h. (Zi-ka-wei, Riverview, and Taihoku).

Jan. 17d. 18h. 48m. 15s. Epicentre $40^{\circ}3'N$. $139^{\circ}5'E$. (as on 1920 Jan. 13d.).

$$A = -\cdot580, B = +\cdot495, C = +\cdot647; \quad D = +\cdot649, E = +\cdot760; \\ G = -\cdot492, H = +\cdot420, K = -\cdot763.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E. 1.7	133	0 31	+ 5	0 46	- 2	—	—
	N. 1.7	133	0 29	+ 3	0 44	- 4	—	—
Tokyo	4.7	178	1 40	+27	1 51	-18	2.4	3.8
Kobe	6.6	213	2 27	+46	—	—	4.0	5.5
Ootomari	6.8	19	1 37	- 7	(3 5)	0	3.1	4.6
Zi-ka-wei	17.2	244	e 3 43	-24	e 7 5	-17	—	9.9
Taihoku	21.4	230	—	—	e 8 54	+ 1	—	—
Hamburg	77.6	332	—	—	—	—	e 40.8	48.8
De Bilt	79.6	333	—	—	—	—	e 42.8	49.1
Uccle	80.8	333	—	—	—	—	e 39.8	—
Paris	83.1	333	—	—	—	—	45.8	—
Rocca di Papa	84.9	323	—	—	—	—	e 46.4	54.2
San Fernando	E. 97.1	332	56 45	?L	—	—	(56.8)	61.8
	N. 97.1	332	55 15	?L	—	—	(55.2)	62.2
La Paz	146.2	52	19 43	[- 7]	—	—	—	—

De Bilt gives MN = +48.4m.

Jan. 17d. Records also at 0h. (Zi-ka-wei), 3h. (La Paz, Strasbourg, Helwan, and Uccle), 5h. (Helwan (2)), 8h. (close to Manila (2)), 9h. (close to Tokyo and Mizusawa), 12h. and 14h. (Helwan), 16h. (La Paz), 17h. (Tokyo), 18h. (Helwan), 19h. (Moncalieri), 21h. (San Fernando), 22h. (Mizusawa (2)).

Jan. 18d. Records at 9h. (Tokyo and Taihoku), 18h. (Osaka), 20h. (Batavia).

Jan. 19d. Records at 5h. (Adelaide and Riverview), 8h. (La Paz), 20h. (San Fernando), 22h. (Helwan).

Jan. 20d. 1h. 42m. 5s. Epicentre $8^{\circ}0'S$. $127^{\circ}5'E$. (as on 1918 Nov. 23d.).

$$A = -\cdot603, B = +\cdot786, C = -\cdot139; \quad D = +\cdot793, E = +\cdot609; \\ G = +\cdot085, H = -\cdot110, K = -\cdot990.$$

The deep focus (0.030) of 1918 Nov. 23d. is retained.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Batavia	-1.2	20.6	274	e 4 37	+ 3	e 8 20	+10	—	9.6
Manila	-1.5	23.5	344	e 5 1	- 4	—	—	6.9	8.9
Melbourne	-2.2	33.7	156	—	—	(12 7)	+ 7	12.1	12.3
Riverview	-2.2	33.8	142	e 8 24	+101	i 11 58	- 3	e 14.3	19.6
Zi-ka-wei	-2.5	39.6	352	e 7 15	-16	e 12 39	-46	—	—
Colombo	-3.1	49.8	286	13 55	?S	(13 55)	-102	—	42.9
Helwan	-4.4	99.4	300	42 55	?L	—	—	(42.9)	—
La Paz	—	151.0	148	19 45	[- 12]	—	—	—	—

Riverview gives also MN = +18.2m.

Jan. 20d. Records also at 1h. (San Fernando), 2h. (Tacubaya), 4h. (Manila, Zi-ka-wei, and Taihoku), 8h. (Rio Tinto), 9h. (Tacubaya), 13h. (Taihoku, Denver, and Manila), 17h. (Toronto), 21h. (Apia and Lick), 23h. (San Fernando).

Jan. 21d. 6h. 0m. 50s. Epicentre $5^{\circ}0'N. 148^{\circ}0'E.$

$A = -.845, B = +.529, C = +.087; D = +.530, E = +.848;$
 $G = -.074, H = -.046, K = -.996.$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	28.3	292	e 14 21	?L	—	—	(e 14.4)	—
Tokyo	31.9	349	33 11	?	—	—	—	—
Riverview	38.9	176	e 7 46	+ 1	e 13 52	+ 1	e 18.2	24.3
Adelaide	40.9	192	—	—	16 34	?SR ₁	23.8	31.4
Batavia	42.6	258	14 43	?S	(14 43)	0	(i 23.4)	—
Melbourne	42.9	183	—	—	—	—	19.2	29.7
Apia	44.2	115	(8 4)	-23	—	—	8.1	—
Honolulu	54.7	69	17 40	?S	(17 40)	+23	20.2	20.9
Victoria	85.4	42	—	—	—	—	—	30.0
Berkeley	86.7	52	—	—	e 24 13	+35	—	—
Helwan	110.2	304	27 10	?S	(27 10)	-20	—	—
La Paz	142.8	110	19 28	[-17]	i 26 49	?	29.3	31.0

Additional records: Riverview gives $i = +19m.3s.$ and $+23m.23s.$, $MN = +20.4m.$ Adelaide $SR_1 = +20m.22s.$ Apia gives $P = +6m.16s.$ and records the true P as $L.$ Helwan $P = +35m.10s.$? $SR_1.$

Jan. 21d. Records also at 0h. (La Paz and Helwan), 2h. (Manila), 5h. (San Fernando), 6h. (Manila and near Mizusawa), 10h. (near Monte Cassino), 17h. and 20h. (La Paz), 21h. (Lick), 22h. (San Fernando), 23h. (Helwan).

Jan. 22d. 21h. 19m. 10s. Epicentre $16^{\circ}0'S. 168^{\circ}0'E.$ (as on 1918 Sept. 25d.).

$A = -.940, B = +.200, C = -.276; D = +.208, E = +.978;$
 $G = +.270, H = -.057, K = -.961.$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia	19.7	86	4 56	+19	e 8 38	+21	13.8	14.4
Riverview	23.4	210	e 5 15	-6	9 33	0	e 11.0	21.0
Sydney	23.4	210	5 8	-13	—	—	9.9	14.4
Christchurch	27.8	173	11 14	?S	(11 14)	+19	16.8	21.3
Melbourne	29.8	218	7 50	?PR ₁	13 32	+121	16.8	20.9
Perth	49.8	241	12 0	?PR ₁	—	—	23.3	—
Honolulu	50.1	43	i 16 14	?S	(i 16 14)	-6	e 24.5	27.3
Manila	55.6	301	e 9 50	+7	—	—	—	—
Batavia	60.6	271	e 12 14	?PR ₁	—	—	—	—
Victoria	88.5	38	22 50	?S	(22 50)	-68	36.6	44.2
Chicago	111.2	51	—	—	—	—	e 51.8	—
Toronto	117.2	49	—	—	—	—	e 65.9	71.0
Helwan	138.0	297	23 50	?PR ₁	(38 50)	?SR ₁	—	—
De Bilt	141.4	343	—	—	—	—	e 65.8	80.7
Uccle	142.8	343	—	—	—	—	e 64.8	—
San Fernando	E. 158.9	347	47 50	?L	—	—	(47.8)	116.8
N.	158.9	347	53 50	?L	—	—	(53.8)	99.8

Additional records: Riverview gives $S = +9m.41s.$, $MN = +12.6m.$ Christchurch gives records at $+13m.38s.$ and $+16m.8s.$ Honolulu gives S as $iP.$ and records $+21m.14s.$ as S (? SR_1). Victoria gives S as P and records $+28m.56s.$ as $S.$ Chicago $L = +55.8m.$ and $+58.8m.$

Jan. 22d. 21h. 44m. 30s. Epicentre $25^{\circ}5'N. 122^{\circ}0'E.$

$A = -.478, B = +.765, C = +.430.$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Taihoku	0.6	0 8	-1	—	—	0.3	0.3
Hokoto	3.0	0 48	+1	(1 14)	-9	1.2	1.6
Zi-ka-wei	5.7	e 1 27	-1	e 2 35	-1	—	3.9
Manila	10.9	e 2 43	0	(4 33)	-19	4.6	5.0
La Paz	167.0	20 4	[+ 9]	—	—	47.2	55.3

Manila gives $MN = +6.0m.$

Jan. 22d. Records also at 2h. (Nagasaki), 9h. (Oaxaca), 16h. (Kodaikanal and La Paz), 19h. (Strasbourg and La Paz), 21h. (La Paz), 23h. (Toronto).

Jan. 23d. Records at 1h. (near Lick and Berkeley), 4h. (near Oaxaca and Tacubaya), 5h. (Kobe (3) and Osaka), 15h. (Helwan), 17h. (near Tortosa, Coimbra, and Granada), 22h. (La Paz and San Fernando).

Jan. 24d. Records at 4h. (near Tacubaya and Oaxaca), 6h. (La Paz), 7h. (Victoria and Toronto), 11h. (Lick, Ootomari, and Manila), 12h. (Helwan), 15h. (Riverview, Strasbourg, and Manila), 16h. (La Paz), 19h. (Tacubaya), 20h. (Manila), 21h. (Apia), 22h. (San Fernando).

Jan. 25d. 3h. 50m. 50s. Epicentre $25^{\circ}5'N$. $122^{\circ}0'E$. (as on 1920 Jan. 22d.).

$$A = -478, B = +765, C = +430.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku	0.6	1 4	+55	—	—	1.8	1.8
Zi-ka-wei	5.7	i 1 38	+10	—	—	e 2.8	4.1
Nagasaki	10.0	6 7	?L	—	—	(6.1)	—
Manila	10.9	e 2 48	+ 5	(4 56)	+ 4	4.9	5.1
Batavia	34.9	i 7 0	-12	—	—	—	—
Helwan	78.1	21 10	?S	(21 10)	-51	—	—
La Paz	167.0	20 0	[-13]	—	—	—	—

Additional records: Zi-ka-wei gives MN = +4.9m. 10m. has been added to the record of Nagasaki. Helwan gives P = +23m.10s.

Jan. 25d. Records also at 0h. (Taihoku and Tucson), 1h. (La Paz and Apia), 2h. (Helwan and Apia), 3h. (Apia), 4h. (Nagasaki), 5h. (Manila and Riverview), 18h. (Apia), 20h. (Tacubaya, Tucson, and Helwan), 23h. (Athens).

Jan. 26d. 11h. 14m. 50s. Epicentre $2^{\circ}1'N$. $127^{\circ}8'E$. (as on 1919 Oct. 26d.).

$$A = -612, B = +790, C = +037; D = +790, E = +613;$$

$$G = -022, H = +029, K = -999.$$

	Δ °	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	14.2	332	e 3 31	+ 2	—	—	—	—
Riverview	42.1	150	e 18 34	?SR ₁	—	—	e 21.3	23.2
Sydney	42.1	150	—	—	—	—	21.2	23.6
Melbourne	43.0	160	—	—	—	—	—	28.8
Honolulu	74.5	69	e 20 58	?S	(e 20 58)	-22	e 37.2	40.3
San Fernando	122.4	317	57 10	?L	—	—	(57.2)	—

Riverview gives MN = +23.4m. Melbourne records from 11h.20m. to 12h.20m.

Jan. 26d. 23h. 1m. 40s. Epicentre $19^{\circ}0'N$. $70^{\circ}0'W$. (as on 1920 Jan. 15d.).

$$A = +323, B = -889, C = +326; D = -940, E = -342;$$

$$G = +111, H = -306, K = -946.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Port au Prince	2.1	e 0 7	-26	0 39	-19	1.0	1.8
Vieques	E. 4.4	0 57	-11	—	—	1.4	1.8
	N. 4.4	0 58	-10	—	—	1.4	1.7
Washington	20.8	5 0	+ 9	8 55	+15	—	—
Chicago	27.2	10 20	?S	(10 20)	-25	—	—
La Paz	35.6	7 24	+ 6	15 59	+175	23.9	26.1

Port au Prince MNW = +1.6m.

Jan. 26d. Records also at 1h. (Helwan), 2h. (Taihoku), 3h. (near Tortosa), 5h. and 8h. (Helwan), 9h. (La Paz), 20h. (Batavia), 21h. (Washington, Chicago, La Paz, Vieques, and Port au Prince), 22h. (near Balboa Heights).

Jan. 27d. Records at 5h. (Helwan), 8h. (Rio Tinto), 13h. (Apia), 14h. (Riverview), 15h. (Helwan, Florence, and San Fernando), 18h. (Manila), 22h. (Apia), 23h. (La Paz (2) and close to Harvard).

Jan. 28d. Records at 0h. (near Tokyo), 1h. (Manila), 2h. (Batavia), 3h. (La Paz), 6h. (Manila), 7h. (Taihoku), 9h. (Tokyo), 18h. (San Fernando).

Jan. 29d. 21h. 44m. 47s. Epicentre $18^{\circ}0S$. $170^{\circ}1E$. (as on 1919 Mar. 22d.).

A = -·937, B = +·164, C = -·309; D = +·172, E = +·985;
G = +·304, H = -·053, K = -·951.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	23·2	223	e 5 19	0	e 9 28	- 1	e 10·8	12·4
Sydney	23·2	223	8 7	?	—	—	—	12·2
Christchurch	25·6	176	(5 37)	- 7	—	—	9·5	13·6
Melbourne	29·6	223	—	—	—	—	8·3	10·6
Adelaide	32·7	233	—	—	—	—	—	11·2
Batavia	62·6	272	—	—	e 18 30	-26	—	—
Helwan	140·7	295	70 13	?L	—	—	(70·2)	—

Additional records: Riverview gives MN = +11·8m. Christchurch SR₁?
= +5m.37s. (?P). Helwan P = +72m.13s.

Jan. 29d. Records also at 13h. (Apia), 19h. (Christchurch and Tokyo), 20h. (San Fernando), 23h. (Lick).

Jan. 30d. 18h. 26m. 45s. Epicentre $4^{\circ}5N$. $77^{\circ}5W$.

A = +·216, B = -·973, C = +·078; D = -·976, E = -·216;
G = +·017, H = -·077, K = -·997.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Balboa Hts. E.	5·0	336	1 29	+12	3 1	+44	3·5	3·9
N.	5·0	336	1 29	+12	3 3	+46	3·5	4·4
Vieques E.	18·1	40	4 48	+30	8 39	+57	12·8	13·0
La Paz	22·9	156	i 4 50	-26	i 9 7	-16	11·6	13·6
Tacubaya	25·9	307	5 39	- 8	9 58	-22	11·5	16·9
Washington	34·4	2	e 7 0	- 8	(12 30)	-16	18·0	—
Georgetown	34·4	2	e 6 33	-35	12 26	-20	e 16·6	—
Ithaca N.	38·0	3	—	—	e 13 29	- 9	16·5	—
E.	38·0	3	—	—	e 13 34	- 4	19·9	—
Ann Arbor N.	38·2	355	8 51	+71	15 3	+82	18·2	—
	38·2	355	8 57	+77	14 51	+70	18·0	—
Harvard	38·3	9	e 7 32	- 8	13 15?	-27	20·3	—
Chicago	38·4	350	8 5	+24	15 50	+126	20·2	—
Toronto	39·2	359	10 15	?	e 16 33	+159	20·8	23·2
Ottawa	40·9	4	e 8 27	+25	14 4	-16	17·6	—
Lick	52·0	317	—	—	—	—	e 24·4	—
Berkeley	52·7	317	—	—	—	—	e 24·5	—
Victoria	58·7	327	17 38	?S	(17 38)	-29	28·0	45·8
Coimbra	71·2	50	—	—	e 20 45	+ 5	35·8	37·4
San Fernando	72·3	54	22 15	?	—	—	—	—
Eskdalemuir	77·4	35	22 12	?S	(22 12)	+19	31·2	41·2
Stonyhurst	77·6	38	23 15	?S	28 45	?SR ₁	38·2	42·8
Oxford	78·0	39	—	—	—	—	41·2	42·0
Kew	78·5	39	—	—	—	—	—	56·2
Paris	80·1	41	—	—	e 22 15	- 9	42·2	43·2
Uccle	81·4	40	e 12 27	0	22 43	+ 4	e 40·2	44·2
De Bilt	81·9	39	—	—	e 22 49	+ 4	e 40·2	44·2
Moncalieri	83·4	45	22 54	?S	(22 54)	- 7	42·7	—
Strasbourg	83·5	43	e 11 15	-84	—	—	—	44·2
Hamburg	84·9	37	—	—	e 23 15	- 3	—	—
Rocca di Papa	87·2	49	e 12 46	-14	16 27	?PR ₁	—	—
Helwan	103·9	59	27 15	?S	(27 15)	+43	—	—
Melbourne	129·0	223	—	—	—	—	e 60·2	66·4
Colombo	154·7	63	—	—	—	—	98·2	107·2

For Notes see next page.

NOTES TO JAN. 30d. 18h. 26m. 45s.

Additional records: Vieques gives PN = +4m.47s. Tacubaya MN = +14.6m. Washington S is given as PR₁, S = +15m.5s. Georgetown LE = +18.0m., LN = +19.6m. Harvard PR₁ = +9m.27s. Ithaca LE = +16.6m. Chicago PR₁ = +13m.5s., L = +30.2m. Ottawa ePR₁? = -9m.23s., L = -21.2m., T₀ = 8h.28m.7s. Victoria gives S as P and S = +23m.3s. Eskdalemuir gives S as P, also PR₁ = +23m.13s., S? = +27m.47s. Uccle SR₁ = +28m.50s., SR₂ = +32m.16s. De Bilt eSR₁ = +29m.21s., eSR₂ = +32m.40s., MN = +42.8m. Moncalieri gives S as P and S = +29m.19s. Helwan P = +28m.15s.

Jan. 30d. 19h. 33m. 10s. Epicentre 17°-0S. 177°-5W. (as on 1919 Aug. 18.).

A = -.955, B = -.042, C = -.292; D = -.044, E = +.999;

G = -.292, H = -.013, K = -.956.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	6.3	61	e 1 32	- 4	(2 44)	- 8	2.7	3.8
Riverview	32.7	232	e 6 52	- 2	e 12 14	- 5	e 16.2	18.0
Sydney	32.7	232	—	—	12 20	+ 1	16.4	36.8
Melbourne	38.9	230	—	—	13 50	- 1	22.1	23.0
Honolulu	42.8	230	e 14 2	?S	(e 14 2)	-43	e 19.5	24.3
Adelaide	42.9	237	—	—	14 38	- 9	21.8	25.4
Victoria	81.2	33	—	—	—	—	—	39.8
Toronto	107.3	49	—	—	—	—	56.1	—
Ottawa	110.1	46	—	—	—	—	56.8	—
De Bilt	144.8	357	—	—	—	—	e 76.8	93.0
Uccle	146.2	358	—	—	—	—	e 78.8	—
Rocca di Papa	153.7	343	e 19 44	[-17]	30 20	?	e 95.2	98.3
Coimbra	154.9	21	—	—	e 63 16	?	77.4	—
San Fernando	159.1	20	—	—	—	—	—	89.8

Additional records: Riverview gives MN = +21.4m. Honolulu S = +16m.50s. (?SR₁). Toronto L = +59.0m. De Bilt MN = +85.7m. Rocca di Papa i = +20m.8s.

Jan. 30d. Records also at 2h. (La Paz), 3h. (San Fernando), 7h. (Sydney), 8h. (Tokyo and Helwan), 14h. and 18h. (La Paz), 19h. (Adelaide).

Jan. 31d. Records at 1h. (Riverview and San Fernando), 6h. (Taihoku), 10h. (La Paz and Helwan), 17h. (Mizusawa), 20h. (near Mizusawa and Tokyo), 23h. (Lick).

Feb. 1d. 13h. 24m. 40s. Epicentre 7°-0S. 150°-0E.

A = -.860, B = +.496, C = -.122; D = +.500, E = +.866;

G = +.106, H = -.061, K = -.992.

Riverview and Manila give fairly consistent values of T₀ at 13h.26m.34s. and 13h.26m.26s.; but the corresponding Δ s are only 19°-8 and 23°-7, which together only make up 43°-5, whereas the stations are 56° apart. There may be some large error, and the expedient has been adopted of assuming the same epicentre as on Feb. 2d.11h. For the alternative supposition of a very deep focus there is scarcely enough support.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	26.8	178	e 6 33	+37	10 13	-24	e 13.4	16.3
Melbourne	31.1	186	—	—	—	—	15.5	22.3
Manila	36.0	309	e 7 11	-11	11 24	-106	15.2	15.4
Batavia	42.9	270	i 8 31	+14	14 14	-33	—	15.9
Osaka	43.9	344	8 14	-11	—	—	—	16.5
Mizusawa	46.9	352	7 38	-68	—	—	—	—
Honolulu	58.3	60	18 8	?S	(18 8)	+ 5	34.8	36.3
Calcutta	67.2	298	11 20	+21	(19 20)	-32	19.3	—
Colombo	71.4	280	—	—	20 50	+ 7	—	—
Pompeii	128.0	317	21 25	?PR ₁	—	—	—	—
Rocca di Papa	128.7	320	e 20 24	?PR ₁	e 21 23	?PR ₁	—	22.4
La Paz	135.5	123	19 46	[+15]	—	—	—	—
Tortosa	136.6	330	22 8	?PR ₁	—	—	—	—

Additional records: Riverview gives also MN = +13.7m. Manila MN = +15.5m. Mizusawa P = +6m.26s. La Paz i = +22m.30s. (?PR₁)

Feb. 1d. Records also at 3h. (Manila), 4h. (Helwan, La Paz, and San Fernando), 9h. (Rio Tinto), 11h. (Mauritius), 12h. (Colombo, Helwan, and La Paz), 13h. (Mizusawa), 14h. (La Paz and Riverview), 15h. (Victoria), 17h. (Batavia and Manila), 18h. (Helwan), 19h. (Mizusawa).

1920. Feb. 2d. 11h. 22m. 15s. Epicentre 7°-0S. 150°-0E.

(suggested by Riverview and as on Feb. 1d.).

A = -860, B = +496, C = -122; D = +500, E = +866;

G = +106, H = -061, K = -992.

		Δ °	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview		26.8	178	e 6 6	-10	i 10 47	+10	e 13.8	22.2
Sydney	E.	26.8	178	6 39	-17	11 15	+38	14.4	20.4
Adelaide		29.9	199	6 39	+12	11 27	-5	14.6	24.0
Melbourne		31.1	186	7 21	+42	12 33	+40	15.0	22.8
Manila		36.0	309	e 6 45	-37	12 45	-25	16.5	17.6
Apia		38.1	102	e 7 13	-26	e 12 45	-54	i 19.2	20.8
Perth		40.4	227	8 29	+31	14 28	+15	(17.2)	—
Hokoto		42.7	317	e 8 46	+30	—	—	—	—
Batavia		42.9	270	8 23	-6	15 24	+37	i 19.0	29.2
Tokyo		43.8	349	7 55	-29	8 38	?	10.8	12.9
Osaka		43.9	344	8 49	+24	18 1	?SR ₁	26.4	29.6
Kobe	E.	44.0	344	8 31	+5	—	—	e 19.2	32.7
	N.	44.0	344	8 31	+5	—	—	21.3	29.9
Nagasaki		44.2	335	8 5	-22	(14 56)	-9	14.9	—
Mizusawa	E.	46.9	352	8 22	-24	15 38	-2	—	—
	N.	46.9	352	8 18	-28	15 19	-21	—	—
Zi-ka-wei		47.0	326	e 8 31	-16	e 15 21	-20	e 21.4	24.2
Ootomari		54.1	355	9 35	+1	17 22	+12	22.2	29.9
Honolulu		58.3	60	9 57	-4	—	—	22.2	34.2
Calcutta		67.2	298	10 57	-2	20 45	+53	28.2	45.8
Colombo		71.4	280	10 33	-53	16 9	?	22.6	54.4
Kodaikanal		74.3	283	11 51	+7	—	—	23.2	55.2
Bombay		80.3	291	12 14	-7	—	—	—	42.3
Sitka	E.	87.6	31	e 22 41	?S	(e 22 41)	-67	40.9	45.9
	N.	87.6	31	e 18 11	?PR ₁	—	—	41.8	45.2
Mauritius	E.	89.6	250	11 45	-89	21 57	-133	—	57.2
	N.	89.6	250	11 51	-83	22 3	-127	—	53.8
Berkeley	E.	92.5	51	e 13 2	-28	e 24 0	-40	e 42.4	46.3
	N.	92.5	51	e 13 4	-26	e 23 38	-62	—	49.4
	V.	92.5	51	e 12 53	-37	e 24 31	-9	e 42.3	46.0
Lick		93.0	52	e 13 21	-11	—	—	e 43.4	45.8
Victoria		94.0	11	12 56	-42	23 45	-71	43.4	48.4
	Z.	94.0	41	13 10	-28	23 45	-71	42.5	51.4
Denver		105.9	50	—	—	—	—	49.8	—
Lemberg		118.0	322	e 18 9	[-38]	e 29 33	+59	e 53.2	66.6
Helwan	E.	118.3	300	18 51	[-3]	—	—	—	81.6
	N.	118.3	300	20 21	?PR ₁	—	—	—	78.8
Chicago		118.5	45	19 58	?PR ₁	29 39	+61	e 48.8	67.9
Cape Town		118.6	224	22 45	?	31 3	+144	67.0	68.0
Ann Arbor	E.	121.1	42	18 57	[+2]	—	—	69.4	74.2
	N.	121.1	42	19 9	[+14]	—	—	69.6	74.2
Budapest		122.0	323	18 57	[-1]	—	—	—	—
Athens		122.5	310	e 18 53	[-7]	e 30 15	+67	—	—
Vienna		123.2	325	i 19 0	[-1]	30 41	-88	e 50.2	57.8
Hamburg		123.3	332	e 20 45	?PR ₁	—	—	e 57.8	69.8
Toronto		123.5	40	18 33	[-29]	e 30 15	+59	i 48.0	75.8
Ottawa		124.9	37	—	—	e 26 1	-204	e 50.8	—
Dyce		125.3	341	—	—	i 31 3	+95	61.8	—
Ithaca	N.	125.9	40	—	—	e 26 37	-175	62.4	—
Pola		126.4	322	22 16	?PR ₁	(e 39 8)	?SR ₁	39.1	73.1
De Bilt		126.5	333	e 19 9	[0]	—	—	e 58.8	76.0
Edinburgh		126.7	340	—	—	—	—	54.8	79.8
Georgetown	E.	127.0	44	e 17 45	+91	26 30	-190	e 43.0	74.9
	N.	127.0	44	e 17 45	+91	—	—	e 42.4	72.8
Washington		127.0	44	e 23 45	?	29 25	-15	e 68.8	—
Eskdalemuir		127.2	340	21 14	?PR ₁	30 1	+20	42.2	—
Cheltenham		127.2	44	—	—	—	—	73.2	—
Padova		127.3	323	19 7	[-5]	30 4	+22	—	76.2
Northfield		127.5	38	—	—	e 24 45	?	e 66.8	—
Strasbourg		127.7	328	e 19 4	[-9]	31 2	+77	e 57.8	76.0
Uccle		127.8	333	e 19 11	[-3]	—	—	e 57.8	77.1

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	Δ		m. s.	s.	m. s.	s.	m.	m.
Zurich	127.9	323	e 19 7	[- 7]	—	—	—	—
Pompeii	128.0	317	19 30	[+16]	31 10	+83	39.8	60.8
Stonyhurst	128.2	338	15 45	-34	—	—	—	84.8
Milan	128.4	326	23 27	?	—	—	60.8	82.8
Monte Cassino	128.2	319	19 36	[+22]	—	—	—	—
Florence	128.5	321	22 40	?PR ₁	39 55	?SR ₁	—	57.6
Rocca di Papa n.	128.7	320	e 21 24	?PR ₁	e 36 4	?SR ₁	e 59.2	87.2
Kew	129.2	337	21 45	?PR ₁	—	—	—	83.8
Besancon	129.4	329	19 23	[+ 7]	—	—	—	—
Oxford	129.4	337	—	—	20 58	?PR ₁	55.8	80.4
Harvard	129.4	39	e 17 11	+46	e 22 36	?PR ₁	65.1	76.3
Moncalieri	129.9	326	i 21 34	?PR ₁	40 23	?SR ₁	—	85.8
Paris	130.0	332	e 19 15	[- 3]	e 25 11	?	38.8	74.8
Puy de Dôme	132.0	329	19 1	[-22]	—	—	—	—
Halifax	132.4	32	—	—	e 27 45	-152	e 53.2	—
Barcelona	135.3	325	e 22 8	?PR ₁	i 34 48	?SR ₁	40.7	74.8
La Paz	135.5	123	19 35	[+ 4]	—	—	—	—
Tortosa	136.6	330	19 33	[0]	32 9	+85	59.0	91.8
Algiers	137.7	319	e 20 2	[+27]	29 25	-85	41.8	76.8
Granada	141.5	325	i 19 27	[-15]	i 30 59	-13	—	—
Coimbra	141.6	332	e 19 23	[-19]	30 45	-28	53.8	85.2
San Fernando	141.6	332	19 9	[-33]	31 21	+ 8	49.2	82.2
Vieques	143.4	327	19 15	[-31]	30 45	-38	—	129.6
N. 143.7	66	23 24	?PR ₁	—	—	—	76.0	108.7
Rio de Janeiro	147.4	158	e 19 39	[-13]	—	—	54.0	120.7
Azores	149.0	352	26 15	?	—	—	—	32.4
Accra	150.4	269	17 45	- 8	—	—	—	88.8

Additional records: Riverview gives also $iP = +6m.18s.$ and $+6m.52s.$, $iPR_1 = +7m.32s.$, $+8m.15s.$, and $+9m.10s.$, $PS = +11m.17s.$, $MN = +17.6m.$, $MZ = +27.4m.$ Recrudescence $MN = +2h.52m.40s.$, $ME = +3h.5m.54s.$, $T_0 = 11h.22m.26s.$ Epicentre $7^\circ 0'S. 150^\circ 0'E.$, as adopted. Melbourne $PR_1 = +8m.27s.$, $SR_1 = +13m.21s.$ Manila $MN = +17.0m.$ Apia $e = +10m.9s.$ and $+16m.45s.$, $T_0 = 11h.22m.26s.$ Epicentre $8^\circ 0'S. 152^\circ 0'E.$ Batavia $i = +9m.15s.$ Zi-ka-wei $MN = +26.4m.$ Ootomari $MN = +36.8m.$ Honolulu alleges two shocks, for the second $P = +14m.9s.$, $L = +27.0$, L rep. $= +160.8m.$ Calcutta $LN = +28.4m.$, $MN = +46.4m.$ Denver $LN = +51.8m.$ Chicago $PR_1 = +25m.18s.$ Ann Arbor, Wiechert record $LEN = +69.6m.$ Toronto $e? = +11m.3s.$, $E? = 12m.21s.$, $E = +19m.57s.$ and $+21m.21s.$, $L = +65.4m.$ Athens $e = +35m.45s.$ Vienna $PR_1 = +23m.5s.$, $PR_2 = +25m.43s.$, $PR_3 = +26m.46s.$, $SR_1 = 37m.7s.$ $SR_2 = +42m.3s.$, $SR_3 = +45m.36s.$ Hamburg $i = +25m.16s.$, $+32m.7s.$, $+38m.9s.$, and $41m.59s.$, $MN = +70.2m.$ Ottawa $PR_1 = +20m.29s.$ Dyce S is given as i and $S = +38m.3s.$ Ithaca $eL?E = +42.2m.$ De Bilt $e = +21m.14s.$ and $+38m.39s.$, $MN = +75.3m.$ Georgetown $LE = +64.8m.$, $LN = +64.1m.$ Washington $eL = +46.2m.$, $+77.8m.$, and $+137.8m.$ Northfield $L = +62.2m.$ and $+121.8m.$ Strasbourg $e = +33m.17s.$, $SR_1 = +38m.32s.$, $MN = +76.6m.$ Uccle $MN = +76.0m.$, $MZ = +77.0m.$ Oxford $e = +39m.13s.$ Harvard $L = +96.4m.$, $M = +79.8m.$ Moncalieri $MN = +80.5m.$ Paris $i = +22m.10s.$, $MN = +39.8m.$ Halifax $PR_1 = +22m.43s.$ Barcelona $i = +23m.5s.$, $+27m.22s.$, and $+37m.46s.$ Algiers $PR_1 = +25m.30s.$ Pola $MN = +81.0m.$ La Paz $i = +23m.25s.$, $L = +88.5m.$, $+90.5m.$, $+95.8m.$ Coimbra $PR_1N = -23m.21s.$, $PR_1E = +23m.23s.$, $PR_2N = +26m.35s.$, $PR_2E = +26m.37s.$, $SN = +29m.55s.$, $SR_1E = +37m.35s.$, $LN = +55.8m.$, $MN = +84.0m.$ Milne records are given in the second line, also $PR_1 = +23m.39s.$ San Fernando $MN = +89.8m.$

Feb. 2d. Records also at 10h. (near Tokyo and Mizusawa), 12h. (Denver), 13h. (Denver, Victoria, Toronto, La Paz, and Helthenham), 15h. (near Balboa Heights; and Batavia), 16h. (Batavia, La Paz, Riverview (2), Melbourne (2), Manila, Perth, and Victoria), 17h. (La Paz and De Bilt), 18h. (Riverview (2) and Batavia), 19h. (La Paz), 20h. (Riverview and De Bilt).

Feb. 3d. 14h. 53m. 0s. Epicentre 7° -0S. 150° -0E. (as on Feb. 2d. 11h.).

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Sydney	26.8	178	9 30	?S	(9 30)	-67	14.3	17.2
Riverview	26.8	178	e 5 52	- 4	e 10 39	+ 2	e 14.5	17.0
Adelaide	29.9	199	8 48	?	13 30	?SR ₁	17.3	21.0
Melbourne	31.1	186	—	—	—	—	e 16.8	17.8
Manila	36.0	309	8 0	+38	—	—	—	—
Perth	40.4	227	—	—	14 0	-13	—	—
Batavia	42.9	270	—	—	14 0	-47	—	—
Honolulu	58.3	60	28 0	?L	31 0	?	35.2	40.5
Victoria	94.0	41	44 13	?L	—	—	(44.2)	49.1
Helwan	118.3	300	33 0	?	—	—	(51.0)	—
De Bilt	126.5	333	—	—	—	—	e 64.0	78.7
La Paz	135.5	123	22 40	?PR ₁	—	—	—	—
San Fernando	143.4	327	21 0	?	—	—	—	—

Additional records: Riverview gives also eSR₂? = +13m.45s. and +14m.15s.,
 MN = +18.5m., MZ = +18.3m. Helwan gives its records as PE and PN
 respectively. De Bilt MN = +81.0m.

Feb. 3d. Records also at 0h. (Riverview (2)), 1h. and 2h. (Riverview), 3h. (Christchurch), 4h. (Riverview), 5h. (Helwan), 6h. (Adelaide, Melbourne, Manila, Perth, and Riverview (2)), 7h. (Honolulu, Victoria, Toronto, and Chicago), 10h. (Riverview), 11h. (Batavia and Dehra Dun), 12h. (Christchurch), 18h. (Batavia and Manila), 19h. (Sydney, Riverview (2), De Bilt, and Helwan), 20h. (Honolulu, Perth, Victoria, Adelaide, and Florence), 21h. (Riverview), 22h. (Florence, Coimbra, and La Paz).

Feb. 4d. Records at 0h. (San Fernando and La Paz), 8h. (Oaxaca and Tacubaya), 10h. (La Paz), 12h. (Batavia, Manila, Tokyo, Lick, and Mizusawa), 13h. (La Paz and De Bilt), 14h. and 15h. (Stonyhurst (3)), 18h. (Helwan), 20h. (La Paz), 21h. (Riverview), 23h. (Tacubaya).

Feb. 5d. Records at 0h. (La Paz and San Fernando), 2h. (Denver), 9h. (Azores and near Lick and Berkeley), 13h. (La Paz (2) and Monte Cassino), 14h. (near Osaka and Kobe), 18h. (Riverview), 21h. (San Fernando).

Feb. 6d. Records at 4h. (Taihoku), 5h. (Batavia), 8h. (Helwan), 9h. (La Paz, Riverview, Manila, and Honolulu), 15h. (Apia), 16h. (La Paz), 17h. (Tokyo), 18h. (near Athens), 20h. (San Fernando), 23h. (Mauritius).

Feb. 7d. 11h. 50m. 30s. Epicentre 56° -8N. 33° -6W.

A = +.456, B = -.303, C = +.837; D = -.553, E = -.833;
 G = +.697, H = -.463, K = -.548.

(Compare 1917 March 3d. 10h. at 55° -0N. 35° -0W.)

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Edinburgh	16.7	80	i 3 55	- 6	i 7 38	+27	—	11.2
Eskdalemuir	16.9	82	(4 1)	- 3	(7 45)	+29	7.8	14.5
Dyce	17.0	75	—	—	—	—	7.8	9.5
Oxford	19.3	91	4 32	- 1	7 58	-10	9.3	14.8
Kew	20.0	88	—	—	—	—	—	12.5
De Bilt	22.7	85	5 13	0	9 24	+ 5	10.9	13.6
E.	22.7	85	—	—	9 26	+ 7	11.5	14.0
N.	22.9	95	e 5 19	+ 3	e 9 22	- 1	11.5	12.5
Paris	22.9	89	e 5 9	- 7	e 9 22	- 1	e 11.5	15.5
Uccle	23.3	125	i 5 20	0	9 4	-27	10.7	13.2
Coimbra	24.7	79	e 5 36	+ 1	i 9 54	- 3	e 13.5	17.4
Hamburg	25.8	95	5 34	-12	10 12	- 6	13.5	—
Besancon	25.9	91	e 4 30	-77	10 24	+ 4	e 13.3	15.6
Strasbourg	26.1	125	12 30	?L	—	—	(12.5)	22.5
Rio Tinto	27.1	111	6 2	+ 3	10 24	-19	12.7	18.3
Tortosa	27.4	126	—	—	—	—	12.5	15.0
San Fernando	27.5	108	e 6 8	+ 5	—	—	e 14.0	17.9
Barcelona	27.8	255	—	—	10 53	- 2	e 14.8	17.3
Harvard	27.8	255	—	—	10 51	- 4	15.6	18.1
N.	27.9	122	6 14	+ 7	—	—	—	—
Granada	27.9	122	6 14	+ 7	—	—	—	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Moncalieri	28.1	97	6 7	- 2	10 34	-27	13.8	17.4
Ottawa	28.3	265	—	—	i 10 58	- 6	e 14.5	—
Ithaca	30.6	260	—	—	—	—	e 17.2	—
Vienna	30.8	82	—	—	—	—	e 15.5	19.1
Toronto	31.4	266	—	—	—	—	e 16.1	18.5
Algiers	31.5	110	6 33	-10	11 47	-13	16.5	21.5
Pola	31.5	90	e 16 26	?L	—	(e 16.4)	19.5	—
Rocca di Papa N.	32.9	95	e 15 29	?L	19 50	?	(15.5)	22.4
Georgetown E.	33.4	257	—	—	—	—	e 19.1	—
Washington	33.4	257	—	—	—	—	e 18.5	—
Ann Arbor E.	34.6	267	—	—	—	—	18.6	19.2
Pompeii	34.6	94	6 27	-43	—	—	—	—
Chicago	37.1	270	8 55	?PR ₁	13 20	- 5	e 17.2	—
Victoria	51.1	301	22 54	?	—	—	25.4	30.3
Helwan	51.9	91	16 30	?S	(16 30)	-13	—	—
Berkeley	58.4	291	—	—	—	—	e 33.8	—
La Paz	78.8	213	11 43	-29	—	—	—	—

Additional records and notes: Eskdalemuir gives P as S and S as L, recording for P + 1m.49s. Coimbra iN = +9m.40s., MN = +11.3m. Hamburg MN = +15.9m. San Fernando MN = +16.0m. Toronto iL = +17.5m. Moncalieri MN = +16.8m. Georgetown LN = +19.8m. Ann Arbor LN (Bosch-Omori) and LE (Wiechert) = +18.7m., MN = +19m.5s. Chicago L = +21.5m.

Feb. 7d. 15h. 7m. 10s. Epicentre 40°-3N. 139°-5E. (as on 1920 Jan. 17d.).

A = -580, B = -495, C = -647; D = -649, E = +760;
G = -492, H = -420, K = -763.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Mizusawa	1.7	133	0 24	- 2	0 53	+ 5	—	—
Tokyo	4.7	178	1 11	- 2	2 13	+ 4	2.6	—
Osaka	6.5	212	—	—	2 31	-26	4.3	4.9
Kobe	6.6	213	—	—	2 58	- 2	4.8	5.6
Taihoku	21.4	230	—	—	—	—	e 10.4	—
Manila	30.4	219	—	—	e 11 50	+ 9	—	—
Batavia	55.3	220	e 8 58	-43	e 17 53	+28	e 25.5	—
Honolulu	55.6	90	16 56	?S	(16 56)	-33	43.8	49.2
Victoria	65.1	46	33 17	?L	—	—	41.6	61.8
Perth	75.5	200	—	—	—	—	34.3	—
Hamburg	77.6	332	—	—	—	—	e 42.8	—
Eskdalemuir	79.2	340	—	—	—	—	45.8	—
De Bilt E.	79.6	333	—	—	e 22 2	-17	e 40.8	47.6
N.	79.6	333	—	—	—	—	e 42.8	44.9
Stonyhurst	80.4	338	46 20	?L	—	—	(46.3)	—
Strasbourg	81.5	330	—	—	—	—	e 47.8	—
Kew	81.8	337	—	—	—	—	—	50.8
Paris	83.1	333	—	—	—	—	e 46.8	53.8
Helwan	83.4	304	23 50	?S	(23 50)	+49	—	—
San Fernando E.	97.1	332	55 50	?L	—	—	(55.8)	60.8
N.	97.1	332	46 50	?L	—	—	(46.8)	64.3
La Paz	146.2	52	19 53	[- 3]	—	—	—	—

Additional records: Osaka gives MN = +5.3m. Kobe MN = +6.0m.
Zi-ka-wei (Δ = 17.2, Az. = 244°-0) records e at 15h. 9m. \pm 2m. Honolulu
S = +32m.50s. Helwan PN = +24m.50s.

Feb. 7d. 15h. 24m. 28s. Epicentre 7°-0S. 150°-0E. (as on 1920 Feb. 3d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	26.8	178	e 6 2	6	i 10 32	- 5	e 14.1	16.4
Adelaide	29.9	199	—	—	12 26	-54	17.6	19.9
Melbourne	31.1	186	12 56	?S	(12 56)	+63	19.2	20.5
Manila	36.0	309	—	—	e 10 17	—	—	—
Batavia	42.9	270	e 8 14	- 3	—	—	e 35.3	—
Chicago	118.5	45	—	—	—	—	e 54.5	—
Toronto	123.5	40	—	—	—	—	60.6	70.4
De Bilt	126.5	333	—	—	—	—	e 66.5	74.4
Pompeii	128.0	317	54 40	?	54 42	?	(51.7)	—
Stonyhurst	128.2	338	69 32	?L	—	—	(69.5)	—
Harvard	129.4	39	—	—	i 62 50	?L	70.6	—
Moncalieri	129.9	326	19 16	[- 2]	25 3	?	29.4	—

Additional records: Riverview gives PS = -10m.54s., MN = -16.2m., MZ = -20.2m. Chicago L = +59.0m. and — = 80.5m. Toronto eL = +65.8m. De Bilt MN = +82.1m. Pompeii a local shock!

Feb. 7d. Records also at 3h. (Tacubaya, La Paz, and Helwan), 4h. (La Paz), 11h. (Rocca di Papa), 13h. (La Paz, Harvard, and near Ootomari), 15h. (near Mizusawa and Riverview), 16h. (Toronto, Moncalieri, and Adelaide), 18h. (Tokyo and La Paz), 19h. (La Paz), 21h. (San Fernando), 23h. (near Tacubaya).

Feb. 8d. 5h. 24m. 12s. Epicentre $35^{\circ}0S$. $111^{\circ}0E$.

A = -294, B = +765, C = -574; D = +934, E = +358;
G = +206, H = -535, K = -819.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Perth	5.1	55	2 55	?	—	—	6.7	—
Adelaide	22.5	97	5 36	+25	10 0	+45	13.7	18.2
Melbourne	27.3	106	—	—	11 36	+50	16.4	18.3
Batavia	29.1	351	6 21	+2	—	—	e 18.2	—
Riverview	32.9	100	e 6 57	+1	e 12 21	-1	e 16.7	19.9
Sydney	32.9	100	12 30	?S	(12 30)	+8	19.0	20.3
Mauritius	48.8	274	10 42	+103	—	—	—	19.5
Manila	50.5	13	e 8 48	-22	—	—	—	—
Colombo	51.2	319	16 0	?S	(16 0)	-34	25.0	29.0
Kodaikanal	55.3	320	25 0	?	—	—	31.2	33.2
Bombay	65.0	321	26 51	?L	—	—	(26.8)	—
Simla	73.4	330	e 35 54	?L	—	—	(e 35.9)	43.8
Helwan	99.2	300	30 48	?SR ₁	—	—	—	—
Honolulu	102.8	74	34 48	?SR ₁	—	—	56.0	62.2
De Bilt	126.2	312	—	—	e 36 48	?SR ₁	e 66.8	78.6
La Paz	128.5	181	e 18 28	[-47]	29 5	-46	57.0	64.8
Kew	129.3	311	—	—	—	—	—	80.8
San Fernando	129.9	290	62 0	?L	—	—	69.6	73.8
Oxford	130.0	311	—	—	—	—	—	80.5
Rio Tinto	130.7	292	72 48	?L	—	—	(72.8)	81.8
Stonyhurst	130.9	311	69 48	?L	—	—	(69.8)	77.8
Eskdalemuir	131.5	316	—	—	—	—	52.8	—
Victoria	138.2	52	68 26	?L	—	—	75.8	78.8
Chicago	163.9	60	—	—	—	—	83.3	—
Toronto	168.2	40	—	—	—	—	e 95.5	97.6
Ottawa	168.4	24	—	—	—	—	89.8	—
Harvard	172.4	12	—	—	—	—	87.4	—

Additional records and notes: Adelaide gives $SR_1 = +11m.54s$. Sydney $S = +16m.48s$. Riverview $eS = +12m.29s$. $SR_1 = +15m.21s$. $MN = +20.1m$. $MZ = +20.0m$. Mauritius $SN = +16m.30s$. $SE = +17m.48s$. De Bilt $MN = +77.7m$. San Fernando $MN = +75.8m$. Harvard $L = +96.2m$, $LE = +98.6m$.

Feb. 8d. Records also at 2h. (La Paz and Riverview), 5h. (Capetown), 7h. (Batavia, Victoria, and Stonyhurst), 9h. (Zi-ka-wei), 13h. and 17h. (La Paz), 18h. (near Port au Prince (2)), 19h. (San Fernando), 20h. (Riverview), 23h. (San Fernando).

Feb. 9d. 2h. 31m. 18s. Epicentre $7^{\circ}0S$. $150^{\circ}0E$. (as on Feb. 7d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	26.8	178	e 5 30	-26	e 10 26	-11	e 13.4	23.3
Adelaide	29.9	199	—	—	12 48	+76	17.4	20.3
Manila	36.0	309	e 10 42	?	—	—	—	—
Perth	40.4	227	—	—	—	—	22.4	—
Batavia	42.9	270	e 8 32	+15	14 10	-37	—	—
Chicago	118.5	45	—	—	—	—	e 63.7	—
De Bilt	126.5	333	—	—	—	—	e 64.7	65.2

Riverview gives also $MNZ = +23.0m$.

Feb. 9d. 19h. 2m. 20s. Epicentre $1^{\circ}2'S$, $149^{\circ}5'E$. (as on 1918 Oct. 27d.).

$$A = -.862, B = +.508, C = -.021; \quad D = +.508, E = +.862; \\ G = +.011, H = -.018, K = -.1000.$$

This epicentre cannot very well be the same as at 2h.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	32.4	302	—	—	—	—	e 16.7	—
Riverview	32.7	178	e 6 55	+ 1	e 12 15	- 4	e 16.4	22.0
Sydney	32.7	178	16 28	?L	—	—	19.7	21.3
Melbourne	36.8	188	—	—	—	—	23.7	25.2
Batavia	42.9	264	—	—	e 14 48	+ 1	(21.0)	—
Perth	44.2	222	—	—	—	—	27.7	—
Honolulu	55.9	63	33 34	?L	—	—	36.3	40.7
Helwan	114.8	303	83 40	?L	—	—	(83.7)	—
De Bilt	121.0	335	—	—	—	—	e 70.7	—
Rocca di Papa	123.9	321	i 85 46	?L	—	—	(i 85.8)	85.8
San Fernando	138.2	330	57 40	?L	—	—	(57.7)	—

Riverview gives also MN = +32.1m., MZ = +31.9m.

Batavia gives L as S.

Feb. 9d. Records also at 0h. (La Paz), 11h. (near Tacubaya (2)), 13h. (Riverview), 15h. (Taihoku), 22h. (Helwan), 23h. (Pompeii, Taihoku, and Calcutta).

Feb. 10d. 9h. 12m. 45s. Epicentre $11^{\circ}7'S$, $162^{\circ}5'E$. (as on 1919 Jan. 8d.).

$$A = -.934, B = +.294, C = -.203; \quad D = +.301, E = +.954; \\ G = +.193, H = -.061, K = -.979.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	24.4	203	e 5 35	+ 3	e 10 1	+ 9	e 12.0	17.0
Apia	25.1	98	e 4 45	-54	—	—	8.2	11.2
Melbourne	30.5	208	11 33	?S	(11 33)	-10	18.0	19.8
Adelaide	31.8	219	6 45	0	12 3	- 2	15.2	21.4
Christchurch	33.0	166	—	—	11 57	-27	17.4	19.8
Perth	47.4	303	8 35	-15	16 12	+26	27.0	—
Manila	48.9	302	e 9 3	+ 4	—	—	—	—
Honolulu	50.9	49	9 33	+21	i 16 15	-15	e 23.2	31.6
Mizusawa	54.6	340	17 3	?S	(17 3)	-13	—	—
Batavia	55.2	272	e 9 15	-25	—	—	—	19.2
Colombo	84.3	278	22 15	?S	(22 15)	-56	—	56.2
Berkeley	85.8	50	—	—	—	—	e 39.0	—
Kodaikanal	87.3	281	50 45	?L	—	—	53.8	55.8
Victoria	88.5	40	23 19	?S	(23 19)	-39	37.7	45.3
Tucson	93.4	58	—	—	—	—	42.9	—
Muritus	99.4	247	23 9	?S	(23 9)	-161	57.0	62.4
Chicago	112.5	49	25 3	?S	34 47	?	55.8	—
Toronto	118.3	46	—	—	—	—	59.2	69.0
Ithaca	120.3	47	—	—	—	—	59.7	—
Ottawa	120.4	44	—	—	e 29 35	+43	58.2	—
Washington	120.9	51	—	—	—	—	e 62.2	—
La Paz	122.5	118	e 6 30	?	—	—	58.1	59.8
Harvard	124.4	46	e 29 3	?S	(e 29 3)	-19	60.5	—
De Bilt	135.7	340	e 56 15	?	—	—	e 66.2	67.3
Moncalieri	140.4	332	—	—	—	—	69.1	—
San Fernando	153.3	340	43 15	?SR ₁	—	—	—	—

Additional records and notes: Riverview gives PS = +10m.32s., MZ = +18.1m.
 Melbourne gives S as P and records S = +16m.15s. Adelaide SR₁ = +13m.57s.
 Christchurch SR₁ = +14m.15s. Mizusawa PE = +19m.3s.
 Kodaikanal may record another more local shock. Victoria gives S as P and records S = +29m.16s.
 Toronto L = +35.8m., eL = +63.4m.
 Ottawa L = +33.5m. Washington L = +67.2m.
 Harvard e = +37m.39s. Moncalieri e = +56m.1s.

Feb. 10d. 10h. 2m. 40s. Epicentre $11^{\circ}7'S$. $162^{\circ}5'E$. (as at 9h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	24.4	203	e 5 25	- 7	9 53	+ 1 e	12.8	16.4
Apia	25.1	98	e 4 50	-49	(9 50)	-15	9.8	11.8
Melbourne	30.5	208	—	—	—	—	17.8	19.3
Adelaide	31.8	219	—	—	11 50	-15	16.1	19.4
Manila	48.9	302	e 10 7	+68	—	—	—	—
Honolulu	50.9	49	16 38	?S	(16 38)	+ 8 e	25.3	30.4
Batavia	55.2	272	8 20	-80	—	—	—	20.3
Victoria	88.5	40	—	—	—	—	—	44.9
Toronto	118.3	46	—	—	—	— e	64.1	70.7
Cape Town	123.0	216	18 8	?	—	—	—	29.1
Harvard	124.4	46	—	—	—	—	66.7	—
San Fernando	153.3	340	—	—	—	—	—	70.3

Additional records and notes: Riverview gives $MZ = +15.4m.$, $MN = +15.9m.$
 Adelaide gives P the same as S, also $SR_1 = +13m.56s.$ Honolulu gives
 S as P and records $eS = +21m.44s.$ San Fernando $MN = +74.3m.$

1920. Feb. 10d. 22h. 7m. 10s. Epicentre $19^{\circ}0'N$. $68^{\circ}0'W$.

(as on 1919 Sept. 11d.).

$A = +.354$, $B = -.877$, $C = +.326$; $D = -.927$, $E = -.375$;
 $G = +.122$, $H = -.302$, $K = -.946$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Vieques E.N.	2.6	107	0 38	- 3	—	—	0.9	—
Port au Prince	4.1	268	i 0 34	-30	i 0 50	-63	1.6	—
Balboa Hts. E.	15.1	230	3 38	- 2	6 30	- 4	8.2	6.7
N.	15.1	230	3 44	+ 4	6 34	0	7.8	6.7
Cheltenham	21.2	341	5 46	+51	9 50	+62	13.2	17.2
Georgetown E.	21.4	340	i 5 0	+ 2	i 9 5	+12 e	10.3	18.9
N.	21.4	340	i 5 0	+ 2	i 9 5	+12 e	10.2	19.0
Z.	21.4	340	5 0	+ 2	9 6	+13 e	10.2	—
Washington	21.4	340	4 58	0	8 54	+ 1	10.7	—
Mobile	21.7	306	e 5 28	+27	i 9 39	+40	11.8	13.5
Harvard E.	23.5	354	e 5 23	0	9 33	- 2	—	13.1
N.	23.5	354	e 5 22	- 1	9 21	-14	—	13.8
Ithaca	24.5	345	5 45	+12	10 7	+13	11.8	—
Northfield	25.5	352	e 5 38	- 5	10 1	-12	12.2	—
Halifax	25.9	7	5 34	-13	9 58	-22	—	—
Toronto	26.4	341	e 6 8	+16	i 10 50	+20	13.2	18.0
Ann Arbor E.	26.8	334	5 50	- 6	9 56	-41	12.3	21.1
N.	26.8	334	5 56	0	10 8	-29	12.2	20.9
E.	26.8	334	5 50	- 6	10 2	-35	11.9	21.2
Ottawa	27.2	348	5 59	- 1	10 34	-11	13.2	—
Oaxaca	27.4	271	6 7	+ 5	12 8	?	16.0	19.2
Chicago	28.2	328	6 8	- 2	10 50	-13	13.0	30.3
Tacubaya E.	29.4	276	7 25	+63	14 17	+173	20.4	24.0
N.	29.4	276	—	—	—	—	20.5	24.3
La Paz	35.5	180	i 6 54	-24	12 30	-33	18.5	28.0
Tucson E.	40.5	298	7 40	-19	13 50	-24	19.7	30.4
Azores	41.2	54	19 26	?L	—	—	(19.4)	25.0
Lick	49.9	303	—	—	e 16 28	+10	—	—
Berkeley E.	50.5	304	e 9 14	+ 4	(e 16 27)	+ 2	—	36.9
N.	50.5	304	e 9 12	+ 2	—	—	e 26.5	32.7
V.	50.5	304	e 9 10	0	—	—	—	34.2
Victoria	53.1	317	8 38	-49	16 6	-51	26.5	33.4
Coimbra E.	54.9	52	i 9 36	- 2	17 16	- 4	24.9	27.1
N.	54.9	52	e 9 48	+10	17 8	-12	23.9	25.7
Rio Tinto	56.1	57	13 50	?PR ₁	—	—	23.8	—
San Fernando	56.4	58	9 50	+ 2	17 26	-13	32.6	48.3
Granada	58.5	57	i 10 7	+ 5	i 18 13	+ 8	—	—
Eskdalemuir	60.2	36	—	—	(17 50)	-36	17.8	—
Edinburgh	60.3	36	18 50	?S	(18 50)	+23	(29.0)	36.0
Stonyhurst	60.4	38	18 20	?S	(18 20)	- 8	28.3	30.3
Oxford	60.9	40	—	—	—	—	26.6	32.3

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$		m. s.	s.	m. s.	s.	m.	m.
Dyce	E.	61.1	34	e 10 45	+25	18 43	+ 6	29.9	35.7
	N.	61.1	34	e 10 45	+25	18 43	+ 6	34.6	35.9
Kew		61.4	41	23 50	?	—	—	—	41.8
Tortosa		61.7	51	10 28	+ 5	18 39	- 5	25.9	39.6
Sitka		61.9	325	e 15 35	?PR ₁	—	—	33.3	36.9
Barcelona		62.9	52	e 15 19	?	19 4	+ 4	26.0	36.3
Paris		63.1	44	e 10 26	- 7	e 19 5	+ 3	25.8	36.8
Puy de Dôme		63.4	48	9 50	-44	—	—	—	—
Algiers		63.9	58	10 37	0	19 13	+ 1	27.3	36.8
Uccle		64.3	40	e 10 44	+ 4	19 16	- 1	e 29.8	36.2
De Bilt	E.	64.8	40	11 5	+21	—	—	30.8	38.4
	N.	64.8	40	—	—	19 30	+ 7	27.8	29.2
Besancon		65.4	45	10 55?	+ 8	—	—	32.8	—
Strasbourg		66.5	43	e 10 44	-11	i 19 50	+ 6	e 30.8	37.7
Moncalieri		66.7	48	11 0	+ 4	19 53	+ 7	27.1	38.8
Zurich		67.2	45	e 11 6	+ 7	—	—	—	—
Accra		67.3	90	25 50	?SR ₁	—	—	—	57.3
Hamburg		67.8	39	e 11 18	+15	i 20 6	+ 6	e 33.8	41.8
Florence		69.4	48	10 50	-23	—	—	—	29.8
Padova		69.6	47	10 35	-40	20 1	-20	—	—
Rocca di Papa		70.7	51	11 23	+ 2	20 36	+ 2	e 34.6	41.2
Pola		71.1	47	i 20 25	?S (i 20 25)	—	-14	e 44.3	46.1
Monte Cassino		71.6	51	11 31	+ 4	—	—	—	—
Pompeii		72.2	50	11 40	+ 9	20 50	- 2	36.8	—
Vienna		72.3	42	11 32	0	—	—	—	55.3
Honolulu		83.2	290	e 14 2	?	i 23 14	+15	e 46.6	51.5
Capetown		97.7	123	21 38	?	—	—	—	67.6
Simla		119.7	33	e 64 50	?L	—	—	(e 64.8)	65.1
Zi-ka-wei		129.0	350	—	—	—	—	e 65.8	—
Mauritius		129.2	100	59 38	?L	—	—	(59.6)	75.1
Taihoku		135.0	347	—	—	—	—	e 68.8	—
Kodaikanal		135.1	52	63 26	?L	—	—	83.9	86.0
Colombo		139.0	54	42 26	?SR ₁	—	—	—	104.8
Riverview		142.2	239	e 20 21	[+38]	e 33 9	?	e 69.8	71.8
Manila		145.2	345	e 19 50	[+ 2]	—	—	—	—
Melbourne		145.7	230	—	—	—	—	e 73.8	82.3
Batavia		166.2	22	e 19 50	[-22]	—	—	e 91.8	97.6

Additional records and notes: Port au Prince gives SR₁ = +1m.28s., L = +2.0m., and +3.7m. Cheltenham MN = +20.2m.; other phases the same for both. Georgetown LE = +13.2m., LNZ = +12.0m. Washington L = +22.8m. and +46.5m. Ithaca PR₁E = +6m.21s. Northfield L = +14.8m. Ann Arbor, the last line recorded is for the Wiechert readings, also LN = +11.9m. Tucson PR₁ = +9m.20s. Azores records for 11d. Berkeley eSE? = +19m.2s., T₀ = 22h.6m.39s. Victoria MZ = +32.8m. Coimbra iN = +17m.30s. San Fernando MN = +34.3m. Sitka eE = +33m.15s., ME = +42.3m. Paris MN = +25.8m. Uccle i = +26m.47s., MN = +36.8m. De Bilt eN = 20m.46s. and +26m.52s. Strasbourg MN = +44.2m. Moncalieri MN = +44.5m. Hamburg e = +29m.32s., MN = +39.7m. Padova PR₁ = +11m.45s., SR₁ = +25m.25s. Pola gives eS = +30m.19s.?SR₁, MN = +46.8m. Mauritius PN = +68m.14s.?LN. Batavia L = +111.8m.

Feb. 10d. Records also at 0h. (Helwan), 2h. (La Paz and near Manila), 3h. (near Tacubaya), 7h. (Zi-ka-wei, La Paz, and near Tacubaya), 9h. (near Taihoku), 10h. (near Mizusawa), 11h. (Taihoku), 13h. (Toronto and near Mizusawa), 14h. (near Mizusawa and Tokyo), 16h. (Riverview and Apia), 17h. (near Tokyo), 20h. (Apia), 21h. (Colombo and Calcutta), 22h. (near Vieques), 23h. (near Padova, Monte Cassino, and Rocca di Papa).

Feb. 11d. Records at 0h. (Vieques), 6h. (La Paz and near Mizusawa and Tokyo), 7h. (Riverview), 8h. (near Vieques and La Paz), 10h. (San Fernando and near Tokyo), 14h. (near Tokyo), 19h. (near La Paz), 20h. and 21h. (near Lick).

Feb. 12d. 0h. 26m. 15s. Epicentre $19^{\circ}\cdot 0\text{N}$. $68^{\circ}\cdot 0\text{W}$. (as on 1920 Feb. 10d.).

A = +.354, B = -.877, C = +.326; D = -.927, E = -.375;
G = +.122, H = -.302, K = -.946.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Vieques	E.	2.6	107	0 44	+ 3	—	—	0.9	2.0
	N.	2.6	107	0 43	- 2	—	—	1.3	2.0
Port au Prince	N.E.	4.1	268	e 0 34	-30	0 48	-65	1.5	2.2
	N.W.	4.1	268	—	—	1 12	-41	—	2.3
Georgetown		21.4	340	e 5 3	+ 5	9 3	+10	13.9	—
Washington		21.4	340	5 3	+ 5	9 3	+10	e 14.2	—
Harvard		23.5	354	5 11	-12	9 36	+ 1	e 12.3	—
Toronto		26.4	341	—	—	—	—	e 15.8	18.0
Ann Arbor	N.	26.8	334	—	—	13 45	?L	18.3	—
Ottawa		27.2	348	—	—	e 8 47	?	e 14.8	—
Chicago		28.2	328	5 47	-23	10 52	-11	16.8	—
La Paz		35.5	180	7 5	-13	15 10	+127	21.5	22.3
San Fernando		56.4	58	27 45	?L	—	—	(27.8)	—

Additional records and notes: Georgetown gives LN = +13.8m. Harvard
L = +12.5m., T₀ = 0h.26m.17s. Toronto L = +4.8m. and +6.8m.

Feb. 12d. 17h. 49m. 10s. Epicentre $19^{\circ}\cdot 0\text{N}$. $68^{\circ}\cdot 0\text{W}$. (as at 0h.).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Vieques	E.	2.6	107	0 39	- 2	0 58	-14	—	1.6
	N.	2.6	107	0 42	+ 1	0 58	-14	—	1.3
Port au Prince		4.1	268	e 0 17	-47	—	—	1.2	1.7
Georgetown		21.4	340	e 5 0	+ 2	—	—	17.1	—
Washington		21.4	340	4 48	-10	7 50	-63	—	—
Harvard		23.5	354	—	—	(9 12)	-23	12.4	—
Chicago		28.2	328	3 5	?	8 5	?	13.8	—
La Paz		35.5	180	6 56	-22	—	—	23.3	25.8
De Bilt	E.	64.8	40	—	—	—	—	e 35.8	38.1

Georgetown gives for eN + 4m.49s. De Bilt eLN = +37.8m.

Feb. 12d. Records also at 5h. and 7h. (La Paz), 8h. (La Paz (3) and Riverview), 9h. (Christchurch and De Bilt), 10h. (near Batavia and near Algiers), 12h. (near Mizusawa), 13h. (La Paz), 15h. (La Paz, Port au Prince, and Vieques), 17h. (Lick), 19h. (Riverview), 20h. (La Paz), 22h. (Vieques, La Paz, and Port au Prince).

Feb. 13d. Records at 1h. (San Fernando), 8h. and 12h. (2) (Riverview), 15h. (Manila and La Paz), 18h. and 21h. (La Paz), 22h. (Helwan), 23h. (La Paz).

Feb. 14d. Records at 0h. (Manila), 2h. (San Fernando), 7h. (La Paz), 12h. (Batavia), 13h. (Batavia and close to La Paz), 20h. (near Berkeley), 23h. (La Paz).

Feb. 15d. 2h. 36m. 43s.
4h. 56m. 18s.

A shock from an origin about $1^{\circ}\cdot 2$ from Padova.

	P.	S.	M.
	m. s.	m. s.	m. s.
I Padova	0 17	0 32	—
II	0 17	0 31	—
I Florence	1 17	—	—
II	-0 55	—	-0 38
I Rocca di Papa	e 0 55	—	1 47
II	e 0 47	—	2 6

Feb. 15d. Records also at 1h. (San Fernando), 3h. (Azores), 5h. and 10h. (La Paz), 13h. (Manila), 15h. (Toronto and Riverview), 16h. (Helwan and Victoria), 21h. (San Fernando), 23h. (Manila (2)).

Feb. 16d. Records at 3h. (La Paz), 4h. (near Taihoku), 6h. (Riverview), 8h. (Algiers), 9h. (Taihoku and Batavia), 13h. (Riverview), 19h. (Apia), 22h. (San Fernando), 23h. (Apia).

Feb. 17d. Records at 4h. (Riverview), 7h. (La Paz (2)), 8h. (Rocca di Papa), 10h. (Taihoku), 11h. (near Athens), 12h. (San Fernando), 14h. (Helwan), 22h. (Manila), 23h. (La Paz).

Feb. 18d. 10h. 31m. 32s. Epicentre $37^{\circ}0'N$. $138^{\circ}5'E$. (as on 1919 Mar. 28d.).

$$A = -\cdot599, B = +\cdot529, C = +\cdot602.$$

		Δ °	P. s.	O - C. s.	L. s.	ME s.	MN s.
Tokyo		1.6	28	+ 4	53	76	—
Mizusawa	E.	2.9	37	- 8	89	—	—
	N.	2.9	28	-17	79	—	—
Osaka		3.5	52	- 3	95	171	159
Kobe		3.6	64	+ 8	109	112	112

Feb. 18d. Records also at 0h. (near Osaka (2) and Tokyo), 1h. (near Tokyo), 5h. (Rocca di Papa and San Fernando), 7h. (La Paz and near Osaka), 14h. (near Athens), 17h. (La Paz), 20h. (Apia), 23h. (Batavia).

Feb. 19d. 4h. 47m. 50s. (I) } Epicentre $37^{\circ}0'N$. $138^{\circ}5'E$. (as on 18d.).
4h. 58m. 50s. (II) }

		Δ °	P. s.	O - C. s.	L. s.	M. s.
I Tokyo		1.6	37	+13	59	68
II		1.6	37	+13	62	68
I Mizusawa	E.	2.9	—	—	82	—
II	E.	2.9	70	?8	101	—
I Osaka		3.5	50	- 5	94	195
II		3.5	57	+ 2	100	160
II Kobe		3.6	57	+ 1	—	177

Feb. 19d. 19h. 54m. 0s. Epicentre $48^{\circ}5'S$. $160^{\circ}5'W$.

$$A = -\cdot625, B = -\cdot221, C = -\cdot749; \quad D = -\cdot334, E = +\cdot943; \\ G = +\cdot706, H = +\cdot250, K = -\cdot663.$$

This epicentre is very doubtful indeed, but seems to satisfy the chief conditions approximately. But for the Honolulu records it might be put at $16^{\circ}0'S$. $171^{\circ}0'W$., as on 1917 June 26, the Manila P being then PR_1 .

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Riverview	38.4	275	e 7 40	- 1	e 13 43	- 1	17.5	20.4
Sydney	38.4	275	14 0	?8	(14 0)	+16	16.1	19.1
Melbourne	40.3	266	—	—	—	— e	20.5	23.0
Adelaide	46.2	266	—	—	—	—	20.8	22.6
Honolulu	69.9	2	28 36	?SR ₁	—	— e	35.0	37.0
Manila	93.5	288	e 15 26	+111	—	—	—	—
San Fernando	157.7	113	81 0	?L	—	—	(81.0)	—
Uccle	170.0	71	—	—	—	— e	68.0	—
De Bilt	170.2	63	—	—	—	— e	67.0	67.7

Additional records and notes: Riverview gives $PS = +14m.13s.$, $SR_1 = +16m.21s.$, $MN = +19.8m.$ Algiers ($\Delta = 163^{\circ}3'$) records from 20h. to 21d.12h. De Bilt e = $+65m.12s.$, $MN = +75.6m.$

Feb. 19d. Records also at 0h. (Lick), 7h. (near Mizusawa), 8h. (Vienna), 12h. (Batavia), 13h. (Colombo), 18h. (near Pompeii, Monte Cassino, and Rocca di Papa), 19h. (near Tacubaya), 20h. (near La Paz), 22h. (Manila).

1920. Feb. 20d. 0h. 1m. 30s. (I) { Epicentre 42° 0N. 46° 0E.
 11h. 44m. 25s. (II) }

A = +.516, B = +.535, C = +.669; D = +.719, E = -.695;
 G = +.465, H = +.481, K = -.743.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		°		m. s.	s.	m. s.	s.	m.	m.
I Helwan	E.	17.0	229	4 48	+43	—	—	—	11.7
I	N.	17.0	229	5 6	+61	—	—	—	11.9
II	E.	17.0	229	4 11	+ 6	—	—	—	11.6
II	N.	17.0	229	5 23	+78	—	—	—	11.4
II Athens		17.5	264	i 4 11	0	7 26	- 3	9.7	10.2
I Vienna		21.7	297	i 5 3	+ 2	—	—	e 15.5	—
II		21.7	297	i 5 5	+ 4	10 59	?L	e 14.1	19.6
I Rocca di Papa		24.7	281	5 35	0	—	—	e 17.9	—
II		24.7	281	e 5 35	0	10 1	+ 4	—	17.7
II Padova		24.7	290	5 34	- 1	8 35	- 4	—	—
I Hamburg		26.5	308	e 5 52	- 1	e 10 28	- 4	e 14.6	17.9
II		26.5	308	i 5 56	+ 3	i 10 33	+ 1	i 13.5	18.0
II Zurich		26.9	294	i 5 59	+ 2	e 10 38	- 1	—	—
II Simla		27.1	103	e 11 23	?S	(11 23)	+40	—	17.6
I Strasbourg		27.4	297	e 6 30	+28	—	—	e 14.5	—
II		27.4	297	6 2	0	10 51	+ 3	e 12.6	19.0
I Moncalieri		27.7	289	6 8	+ 3	10 48	- 6	16.3	17.1
II		27.7	289	6 4	- 1	10 44	-10	14.6	17.5
II Besancon		28.7	294	7 11	+56	—	—	17.6	—
I De Bilt		29.2	304	e 6 17	- 3	e 11 33	+13	15.5	18.2
II	E.	29.2	304	6 20	0	i 11 38	+18	14.6	18.3
II	N.	29.2	304	—	—	—	—	13.6	17.7
I Uccle		29.6	302	5 50	-34	—	—	e 14.5	—
II		29.6	302	7 23	+59	e 11 21	- 6	14.1	17.9
II Paris		30.9	300	—	—	e 9 35	-135	16.6	19.6
I Kew		32.5	304	—	—	—	—	—	20.5
II		32.5	304	—	—	—	—	—	19.6
I Oxford		33.2	304	6 20	-38	11 5	-82	—	23.5
II Dyce		33.8	315	(i 7 11)	+ 8	i 7 11	?P	16.1	21.9
II Tortosa		33.8	283	—	—	—	—	e 15.6	23.6
I Stonyhurst		33.8	306	—	—	—	—	—	22.6
I Edinburgh		34.3	310	—	—	—	—	e 19.5	25.4
II		34.3	310	e 12 53	?S	(e 12 53)	+ 9	19.9	25.4
I Eskdalemuir		34.3	310	—	—	—	—	17.5	21.5
II		34.3	310	—	—	—	—	16.6	22.2
II San Fernando		40.2	279	17 5	?SR ₁	—	—	24.1	29.1
II Rio Tinto		40.0	281	20 35	?L	—	—	(20.6)	33.6
I Coimbra		40.4	285	e 18 15	?	—	—	21.5	—
II	E.	40.4	285	e 7 50	- 8	14 2	-11	23.0	27.1
II	N.	40.4	285	—	—	—	—	21.3	24.8
I Colombo		46.1	131	30 30	?L	—	—	(30.5)	—
II		46.1	131	30 5	?L	—	—	(30.1)	33.6
II Zi-ka-wei		59.5	74	—	—	e 19 2	+45	—	—
II Mauritius	N.	63.0	169	30 11	?L	—	—	(30.2)	35.0
II Manila		69.2	90	—	—	e 21 5	+49	—	—
II Batavia		73.2	117	e 12 6	+29	21 39	+35	—	23.4
I Cape Town		80.0	202	—	—	—	—	—	49.8
II		80.0	202	42 29	?L	—	—	(42.5)	49.8
II Toronto		81.4	324	—	—	—	—	52.8	—
II Chicago		86.4	329	—	—	23 45	+11	e 35.6	—
II Victoria		89.1	354	—	—	42 53	? L	49.8	63.5
II La Paz		118.8	273	20 35	?PR ₁	—	—	—	—

Additional records and notes: Hamburg (I) gives MN = +15.8m., MZ = +17.5m. Hamburg (II) iPE = +6m.0s., iN = +14m.59s., MN = +15.8m., MZ = +17.6m. Strasbourg (II) i = +8m.5s. (?PR₁). De Bilt (I) LN = +14.5m., MN = +18.0m. De Bilt (II) eS = +11m.23s. Eskdalemuir (II) MN = +22.0m. San Fernando (II) MN = +25.1m. Mauritius (II) PE = +29m.47s. Chicago (II) L = +44.6m.

Feb. 20d. Records also at 1h. (La Paz), 2h. (Helwan and near Tacubaya), 4h. (Padova), 6h. (Tokyo), 18h. (Florence), 23h. (De Bilt).

Feb. 21d. Records at 0h. (La Paz and Apia), 1h. and 4h. (Helwan), 6h. (La Paz), 13h. (near Port au Prince and Vieques and Manila), 14h. (La Paz, Hamburg, and De Bilt), 15h. (La Paz and Helwan), 16h. (La Paz (2) and Helwan), 17h. (La Paz, Nagasaki, and Helwan), 18h. and 23h. (2) (La Paz). The La Paz records seem to be repetitions from an origin about 21° distant.

1920. Feb. 22d. 17h. 35m. 40s. Epicentre $46^{\circ}7'N$. $145^{\circ}8'E$.
(as on 1918 Dec. 9d.).

$A = -.567$, $B = +.386$, $C = +.728$; $D = +.562$, $E = +.827$;
 $G = -.602$, $H = -.409$, $K = -.686$.

It is not possible to obtain a determination without allowing a considerable correction for depth of focus, and 0.050 has accordingly been adopted.

For the antiecentric evidence see the note to La Paz.

		Corr. for Focus	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Ootomari		-1.3	2.1	270	1 7	+14	—	—	2.0	2.7
Hakodate		-0.1	6.1	218	1 38	+ 3	—	—	—	—
Mizusawa	E.N.	-0.3	8.3	206	2 13	12	2 51	-46	—	—
Tokyo		-0.9	11.9	205	2 43	- 1	(4 58)	- 4	5.0	—
Osaka		-1.2	14.3	217	3 29	-15	—	—	6.1	6.8
Kobe		-1.2	14.4	218	3 23	+ 7	—	—	6.1	6.2
Zi-ka-wei		-2.5	24.3	239	e 5 4	+ 1	e 8 53	- 3	—	11.6
Taihou		-3.1	29.0	230	e 5 52	+ 5	—	—	—	—
Manila		-3.9	38.2	220	e 7 1	- 6	12 35	- 9	16.4	17.2
Honolulu		-4.9	51.7	99	i 15 50	? S	i 15 50	+12	21.3	22.3
Simla		-5.1	53.8	280	15 32	? S	(15 32)	-30	—	22.7
Victoria		-5.4	57.5	52	16 32	? S	(16 32)	-13	22.9	23.8
Batavia		-5.6	63.1	225	i 10 5	+ 9	i 18 9	+16	—	21.4
Berkeley	B.	-5.7	64.6	61	e 10 8	+ 4	e 18 15.	- 5	e 18.2	18.4
	N.	-5.7	64.6	61	i 10 9	+ 5	(e 18 20)	+10	e 18.3	18.4
Colombo		-5.9	68.6	259	11 20	-50	—	—	—	23.6
Hamburg		-6.0	73.0	335	e 11 2	+ 4	i 20 2	+12	e 30.4	30.7
Edinburgh		-6.0	74.2	343	—	—	20 16	+12	—	—
Eskdalemuir		-6.0	74.7	343	11 21	+12	20 21	+11	—	—
Vienna		-6.0	75.3	329	i 11 16	+ 3	i 20 32	+14	—	—
De Bilt		-6.0	75.6	326	i 11 20	- 5	i 20 26	+ 5	e 31.1	—
Uccle		-6.1	77.0	337	11 22	0	20 38	+ 1	e 27.3	—
Oxford		-6.1	77.6	340	e 20 26	? S	i 20 55	+11	—	—
Strasbourg		-6.1	78.0	332	e 11 28	- 1	20 51	+ 2	—	—
Zurich		-6.2	78.8	331	e 11 34	0	e 21 0	+ 3	e 21.0	—
Paris		-6.2	79.3	338	11 37	0	i 21 8	+ 5	28.3	45.3
Padova		-6.2	79.4	330	11 45	+ 8	21 18	+14	—	—
Chicago		-6.2	79.7	38	11 38	- 1	20 55	-13	32.9	—
Besancon		-6.2	79.9	333	11 40	0	21 12	+ 3	31.3	—
Riverview		-6.2	80.7	175	e 10 52	-54	e 21 17	- 3	e 34.8	37.5
Ottawa		-6.2	81.0	29	i 11 45	- 3	i 21 11	-13	34.3	—
Moncalieri		-6.2	81.2	331	11 47	- 2	i 21 26	0	29.1	—
Toronto		-6.2	81.2	31	—	—	21 26	0	21.4	—
Rocca di Papa N.		-6.3	82.2	326	11 51	- 3	21 36	0	e 33.2	—
Pompeii		-6.3	82.4	324	11 43	-13	21 33	- 5	—	—
Northfield		-6.3	83.0	27	e 16 0	? P ₁ R ₁	25 16	? S ₁ R ₁	—	—
Harvard	B.	-6.4	85.1	27	12 6	- 5	21 55	-13	—	—
	N.	-6.4	85.1	27	12 8	- 3	22 9	+ 1	e 38.2	—
Barcelona		-6.4	86.1	333	e 10 56	-81	i 22 30	+10	e 34.2	—
Washington		-6.4	86.2	32	14 40	+142	24 23	+127	—	24.9
Georgetown		-6.4	86.2	32	12 12	- 6	22 1	-20	—	—
Cheltenham		-6.4	86.5	32	22 29	? S	(22 29)	+ 5	—	22.8
Tortosa		-6.4	87.2	335	12 24	0	22 30	- 3	34.3	35.8
Algiers		-6.5	90.1	330	22 26	? S	(22 26)	-39	37.3	—
Granada		-6.5	91.7	337	i 12 36	-13	i 22 39	-42	—	—
Rio Tinto		-6.5	92.0	340	—	—	25 20	+115	—	28.3
San Fernando		-6.6	93.2	339	19 20	? P ₁ R ₁	—	—	—	27.3
La Paz		—	138.8	54	e 14 27	?	27 37	-200	42.3	—

For Notes see next page.

NOTES TO FEB. 22d. 17h. 35m. 40s.

Additional records and notes : Ootomari gives MN = +2.1m. Osaka MN = +6.7m. Zi-ka-wei gives its readings for 23d. Manila MN = +17.0m. Honolulu gives iS as iP and records iS = +17m.50s. Victoria gives S as P and records S = +19m.27s. Hamburg MN = +30.6m. Edinburgh records also +23m.0s. De Bilt e = +16m.20s. and +18m.5s., iE = +23m.1s., iN = +23m.6s., eE = +27m.39s. Epicentre 42°5'N., 148°2'E. Uccle i = +23m.20s. Oxford i = +23m.30s. Strasbourg e = +23m.25s. Padova PR₁ = +13m.42s. and +15m.44s., SR₁ = +21m.34s. and +21m.36s. Riverview eS = +21m.25s., MN = +40.6m. Ottawa eE = +23m.56s. Moncalieri S = +20m.5s. Toronto L = +18.3m. Harvard SN = +22m.0s., L = +48.4s., T₀ = 17h.35m.40s. Barcelona PS? = +23m.32s. Georgetown iEN = +22m.12s. Cheltenham PE = +22m.30s. Algiers gives S as P and records S = +25m.35s. (?SR₁). San Fernando MN = +29.3m. La Paz i = +18m.53s. (this may be [P], in which case O-C = -45s.), and +21m.52s.

Feb. 22d. Records also at 1h. (near Taihoku), 2h. (near Tacubaya), 3h. (near Hokoto and Taihoku), 4h. (Kingston), 5h. (La Paz), 11h. (Tokyo), 16h. (Helwan), 22h. (Tokyo).

Feb. 23d. Records at 6h. (near Osaka and Kobe), 7h. (Tacubaya), 9h. and 10h. (Rocca di Papa), 11h. and 15h. (La Paz), 17h. (near Athens), 20h. (La Paz), 22h. (Helwan and San Fernando).

Feb. 24d. Records at 8h. (Harvard, Chicago, Helwan, De Bilt, and Uccle), 15h. (La Paz and Helwan), 20h. (Helwan), 23h. (near Mizusawa).

Feb. 25d. 17h. 56m. 18s. Epicentre 35°0'N. 10°0'E.

$$A = +.807, B = +.142, C = +.574; \quad D = +.174, E = -.985; \\ G = +.565, H = +.100, K = -.819.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°		m. s.	s.	m. s.	s.	m.	m.
Algiers	5.9	290	1 31	0	2 28	-13	4.7	—
Pompei	6.8	31	2 42	+58	4 32	+87	6.7	8.7
Rocca di Papa N.	7.1	17	1 50	+2	e 3 13	0	—	5.0
Barcelona	8.9	318	e 2 12	-3	—	—	3.6	5.7
Tortosa	9.4	311	2 18	-4	3 40	-33	4.2	5.6
Moncalieri	10.1	351	e 0 56	-95	3 16	-76	4.8	6.4
Padova	10.5	7	2 41	+4	5 35	+52	—	7.7
Besancon	12.6	348	3 5	-2	—	—	6.7	—
San Fernando	13.2	281	5 42	?S	(5 42)	-7	—	—
Rio Tinto	13.6	286	9 42	?L	—	—	(9.7)	11.2
Strasbourg	13.7	354	e 3 18	-4	e 6 8	+7	e 6.7	—
Vienna	14.1	18	3 28	+1	—	—	—	10.0
Paris	14.9	341	—	—	e 7 10	?L	8.7	10.7
Coimbra	15.5	295	3 39	-7	7 6	+22	8.2	10.2
Uccle	16.3	347	e 3 36	-20	—	—	e 6.7	9.7
De Bilt	17.4	350	—	—	—	—	e 8.0	10.4
Hamburg	18.6	0	i 4 24	0	i 7 47	-6	e 11.1	12.5
Oxford	18.6	338	9 58	?L	—	—	(10.0)	13.5
Helwan	18.7	100	8 42	?S	(8 42)	+47	(13.7)	—
Stonyhurst	20.7	339	8 12	?S	(8 12)	-26	(12.2)	8.2
Eskdalemuir	22.2	340	—	—	—	—	11.7	—
Edinburgh	22.7	341	—	—	—	—	11.7	15.2

Additional records : Vienna gives MN = +11.3m. Moncalieri MN = +6.1m. Coimbra MN = +10.0m. De Bilt MN = +11.8m. Hamburg MN = +12.7m. Helwan gives its two records as PE and PN. Stonyhurst gives readings 1h. too early.

Feb. 25d. 22h. 39m. 48s. Epicentre $6^{\circ}5'N$, $127^{\circ}0'E$. (as on 1918 Feb. 7d.).

A = -0.598, B = +0.793, C = +0.113; D = +0.799, E = +0.602;

G = -0.068, H = +0.090, K = -0.994.

The depth of focus found for 1918 Feb. 7d. has not been retained.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	10.0	325	e 2 26	-4	4 14	-15	4.6	4.7
Taihoku	19.3	345	8 12	?S	(8 12)	+4	—	—
Batavia	23.8	238	i 5 18	-8	9 33	-7	e 13.2	—
Zi-ka-wei	25.3	349	e 5 30	-11	—	—	—	—
Perth	39.9	195	—	—	13 12	-53	—	—
Adelaide	42.9	166	—	—	14 30	-17	23.8	32.3
Sydney	46.4	152	15 30	?S	(15 30)	-3	18.7	29.7
Riverview	46.4	152	e 8 42	-1	i 15 34	+1	e 26.2	28.4
Colombo	46.8	273	15 36	?S	(15 36)	-2	—	32.0
Simla	52.6	305	19 54	?PR ₁	—	—	—	—
Honolulu	73.6	70	22 36	?S	(22 36)	+87	e 42.2	e 47.2
Helwan	91.7	300	24 12	?S	(24 12)	-20	—	—
Victoria	97.9	39	36 27	?SR ₁	40 29	?	45.9	51.8
Hamburg	100.2	328	e 17 12	?	i 24 31	-87	e 50.2	59.0
Rocca di Papa	103.3	316	e 18 18	?PR ₁	e 24 30	-117	e 54.3	—
De Bilt	103.5	328	—	—	e 24 44	-105	e 49.2	54.2
Uccle	104.5	327	—	—	e 24 48	-110	51.2	57.2
Moncalieri	105.3	320	e 18 45	?PR ₁	34 53	?SR ₁	53.8	65.3
Edinburgh	105.4	333	—	—	—	—	50.2	65.7
Eskdalemuir	105.8	333	24 41	?S	(24 41)	-129	47.2	—
Stonyhurst	106.3	332	45 12	?	52 12	?L	56.7	64.2
Kew	106.6	329	—	—	—	—	—	67.2
Paris	106.6	326	—	—	—	—	e 55.2	57.8
Oxford	107.0	329	50 41	?L	—	—	(50.7)	—
Tortosa	111.9	319	—	—	—	—	e 52.2	66.8
Coimbra	117.9	323	e 29 12	?S (e 29 12)	+29	e 59.7	—	—
	117.9	323	30 48	?S	(30 48)	+135	e 61.6	66.7
La Paz	162.1	125	20 22 [+13]	—	—	—	—	—

Additional records: Manila gives also MN = +4.9m. Adelaide SR₁ = +17m.42s. Riverview gives its readings as on 26d., also eSR₁? = +18m.29s., MN = +28.8m. Hamburg MN = +53.2m. Rocca di Papa L = +58.9m. De Bilt MN = +55.6m. Uccle eL = +37.2m. Moncalieri i = +24m.49s., MN = +62.6m. Eskdalemuir eS = +33m.24s. (?SR₁). Coimbra gives a Milne record (second line) as well as its usual one and records eS? = +41m.36s.

Feb. 25d. 23h. 32m. 20s. Epicentre $38^{\circ}8'N$, $32^{\circ}9'E$. (as on 1918 Jan. 16d.).

A = +0.654, B = +0.423, C = +0.627; D = +0.543, E = -0.840;

G = +0.526, H = +0.340, K = -0.779.

But the evidence for actual coincidence with the old epicentre is not good. The residuals would be much improved by moving the epicentre about one degree further west.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	7.2	266	1 36	-13	—	—	1.9	2.0
Lemberg	12.7	333	e 4 34	+85	—	—	e 6.3	7.2
Budapest	13.2	316	3 53	+37	—	—	—	—
Pompeii	14.2	283	2 53	-36	4 38	-95	—	—
Vienna	15.2	314	e 3 36	-6	6 17	-20	e 6.7	8.4
Rocca di Papa	15.6	287	e 3 13	-34	6 22	-24	—	7.1
Padova	16.9	300	5 22	+78	7 10	-6	9.5	—
Strasbourg	20.5	306	e 4 45	-2	—	—	9.3	—
Besancon	21.2	302	9 40?	?L	—	—	10.7	—
Hamburg	21.5	321	e 5 4	+5	—	—	e 9.9	15.6
De Bilt	23.3	314	—	—	e 9 58	+27	—	—
Uccle	23.3	310	e 10 40	?L	—	—	(e 10.7)	—
Algiers	23.5	275	e 5 3	-20	9 57	+22	23.7	—
Paris	23.9	305	—	—	—	—	e 10.7	13.7
La Paz	108.7	264	e 10 13	?	—	—	56.7	61.0

Additional records: Athens gives MN = +2.3m.

Hamburg MN = +12.9m.

Feb. 25d. Records also at 0h. (Florence, Helwan, and La Paz), 8h. (Helwan), 12h. (La Paz (2)), 13h. (La Paz), 17h. (Simla), 19h. (La Paz), 20h. (Colombo and La Paz).

Feb. 26d. 1h. 26m. 0s. Epicentre $5^{\circ}0'N$. $110^{\circ}0'E$.

$A = -.341$, $B = +.936$, $C = +.087$; $D = +.940$, $E = +.342$;
 $G = -.030$, $H = +.082$, $K = -.996$.

A depth of focus 0.050 is assumed.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Batavia	-0.8	11.6	196	i 2 36	- 5	4 40	- 10	—	6.1
Manila	-1.3	14.4	48	e 3 14	0	—	—	—	—
Taihoku	-2.3	22.9	28	10 4	? L	—	—	(10.1)	—
Zi-ka-wei	-3.0	28.3	21	e 5 46	+ 5	—	—	—	—
Colombo	-3.2	30.1	275	17 18	? L	—	—	(17.3)	20.7
Perth	-3.7	37.3	170	—	—	12 0	-34	—	—
Melbourne	-5.1	53.7	145	—	—	—	—	e 27.3	31.3
Riverview	-5.2	54.9	139	e 12 36	? PR ₁	e 17 56	+101	e 24.8	30.3
Helwan	-6.1	77.0	300	24 0	? SR ₁	—	—	—	—
Rocca di Papa	-6.5	92.1	313	—	—	—	—	e 65.6	69.5
De Bilt	E. -6.6	95.1	324	e 26 42	?	—	—	e 54.0	57.4
	N. -6.6	95.1	324	—	—	e 39 6	?	e 53.0	58.2
Uccle	-6.6	95.9	322	—	—	—	—	e 53.0	—
Eskdalemuir	-6.7	98.7	329	—	—	—	—	57.0	—
Stonyhurst	-6.7	98.9	325	28 30	? SR ₁	43 0	? L	(43.0)	—
La Paz	—	168.4	189	19 21	[-53]	—	—	—	—

Additional records: Batavia gives $P_2 = +3m.26s.$, $eS_2 = +5m.32s.$ Helwan
 gives also 1h.18m.0s., earlier than T_0 . Riverview MN = +28.4m.

Feb. 26d. 23h. 4m. 3s. Epicentre $38^{\circ}8'N$. $32^{\circ}9'E$. (as on 1920 Feb. 25d.).

$A = +.654$, $B = +.423$, $C = +.627$; $D = +.543$, $E = -.840$;
 $G = +.526$, $H = +.340$, $K = -.779$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	7.2	266	1 51	+ 2	—	—	2.2	2.7
Lemberg	12.7	333	—	—	—	—	e 6.8	7.4
Budapest	13.2	316	3 31	+15	5 53	+ 4	—	—
Pompeii	14.2	283	3 24	- 5	6 14	+ 1	—	—
Vienna	15.2	314	6 27	? S	(6 27)	-10	(9.4)	—
Rocca di Papa	15.6	287	e 3 35	-12	—	—	—	6.0
Padova	16.9	300	6 8	? S	(6 8)	-68	—	9.2
Moncalieri	19.6	296	e 4 32	- 4	7 31	-44	9.3	—
De Bilt	23.3	314	—	—	—	—	e 11.4	11.6

Additional records: Vienna gives S and L as P and S respectively.

Feb. 26d. Records also at 3h. (Apia), 7h. (near Athens and Rocca di Papa),
 10h. (San Fernando), 15h. (La Paz), 16h. (Helwan), 18h. (Manila, Apia,
 and Batavia), 20h. (near Athens (2)), 22h. (Riverview and near Tokyo),
 23h. (Padova).

Feb. 27d. 3h. 51m. 36s. Epicentre $35^{\circ}0'N$. $69^{\circ}0'E$.

$A = +.294$, $B = +.765$, $C = +.574$; $D = +.934$, $E = -.358$;
 $G = +.205$, $H = +.536$, $K = -.819$.

This determination is very uncertain: the shock must have been very slight and its phases difficult to distinguish.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Simla	7.9	117	5 54	?	—	—	8.7	9.0
Dehra Dun	8.9	119	—	—	—	—	6.4	—
Calcutta E.N.	21.0	122	4 48	- 5	8 36	- 8	12.6	—
Kodaikanal	25.9	161	5 48	+ 1	—	—	—	—
Colombo	29.8	158	7 24	+58	9 0	-151	17.1	19.9
Helwan	32.0	271	5 0	-107	—	—	—	15.2
Pompeii	42.7	296	7 51	-25	—	—	27.8	—
Rocca di Papa	43.9	296	e 6 26	-119	—	—	e 28.3	—
Hamburg	44.6	314	—	—	e 15 24	+14	e 28.4	35.4
Taihoku	46.1	88	—	—	—	—	e 31.2	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Strasbourg	46.3	307	e 8 42	0	—	—	e 25.4	33.2
Moncalieri	46.8	302	e 9 45	+59	17 14	+96	26.9	33.0
De Bilt	47.6	312	—	—	e 15 18	-31	e 26.4	32.0
Uccle	48.2	310	—	—	e 15 12	-44	—	—
Manila	50.8	100	—	—	—	—	e 34.4	—
Kew	51.0	312	—	—	—	—	—	42.4
Edinburgh	52.1	317	—	—	—	—	—	42.9
Eskdalemuir	52.1	317	—	—	—	—	24.4	—
Algiers	52.3	292	e 6 35	?	—	—	27.4	29.9
Tortosa	53.0	299	—	—	—	—	e 19.4	32.9
Mauritius	E. 56.1	192	12 30	?PR ₁	—	—	—	16.2
Rio Tinto	59.2	297	30 24	?L	—	—	(30.4)	40.4
San Fernando	59.4	295	12 54	?PR ₁	—	—	33.4	35.4
Coimbra	59.6	300	18 22	?S	(18 22)	+ 4	34.4	35.8
La Paz	137.6	284	69 52	?L	—	—	79.9	—

Additional records and notes: Colombo gives L = +18.5m. Helwan
P = +8m.54s., MN = 13.9m. Hamburg MN = +37.4m. Strasbourg
MN = +30.2m. De Bilt e = +19m.12s., MN = +37.2m. Uccle
e = +19m.0s. Mauritius PN = +13m.12s. San Fernando MN =
+35.9m. Coimbra gives S as P and S = +26m.2s.

Feb. 27d. 7h. 10m. 54s. Epicentre 18° 0S. 167° 0E. (as on 1918 July 29d.).

A = -.927, B = +.214, C = -.309; D = +.225, E = +.974;
G = +.301, H = -.070, K = -.951.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	21.3	219	e 4 21	-36	e 8 49	- 1	e 10.5	12.7
Sydney	21.3	219	4 48	- 9	8 54	+ 4	11.7	12.9
Christchurch	26.0	171	—	—	10. 6	-16	14.1	16.5
Melbourne	27.7	220	—	—	11 12	+18	14.4	18.1
Honolulu	52.2	43	16 48	?S	(16 48)	+ 2	25.6	32.5
Victoria	90.7	39	25 0	?S	(25 0)	+39	—	46.1
Chicago	113.2	50	—	—	—	—	53.1	—
Helwan	138.0	295	23 6	?	—	—	—	—
De Bilt	E. 143.1	342	—	—	—	—	e 74.1	99.5
	N. 143.1	342	—	—	—	—	e 77.1	80.8
Pompeii	147.2	321	19 43	[- 8]	—	—	—	—
Rocca di Papa	147.7	323	e 19 29	[-23]	—	—	—	19.9
San Fernando	N. 160.6	343	92 6	?L	—	—	(92.1)	102.1

Additional records: Riverview eS = +8m.58s., MN = +12.0m. Christ-
church PR₁ = +5m.36s. Honolulu gives S as P and eS = +22m.12s.
Chicago L = +60.1m. Helwan P = +43m.6s. San Fernando PE =
+99.1m.

Feb. 27d. 10h. 34m. 56s. Epicentre 18° 0S. 167° 0E. (as at 7h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	21.3	219	e 5 4	+ 7	e 9 3	+13	e 10.7	12.6
Sydney	21.3	219	4 52	- 5	9 10	+20	11.9	13.1
Christchurch	26.0	171	—	—	10 4	-18	14.1	16.5
Melbourne	27.7	220	—	—	10 34	-20	14.2	17.1
Honolulu	52.2	43	17 46	?S	(17 46)	+60	25.1	31.0
Chicago	113.2	50	—	—	—	—	e 59.1	—
Helwan	138.0	295	87 4	?L	—	—	(87.1)	—
Rocca di Papa	147.7	323	e 19 48	[- 4]	—	—	—	20.0

Additional records: Riverview gives eS = +9m.5s., MN = +12.0m. Helwan
gives P = +89m.4s.

Feb. 27d. Records also at 2h. and 5h. (near Tokyo), 9h. (Riverview), 10h.
(Rocca di Papa and Melbourne), 12h. (La Paz and Manila), 16h. (La
Paz (2)), 17h. (Rocca di Papa and near Athens), 18h. (near Tacubaya),
19h. (Apia), 23h. (La Paz).

Feb. 28d. 18h. 41m. 0s. Epicentre $12^{\circ}0'S$, $69^{\circ}0'W$.

A = +.351, B = -.913, C = -.208; D = -.934, E = -.358;
G = -.075, H = +.194, K = -.978.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz	4.6	169	i 1 13	+ 2	(2 14)	+ 8	2.2	2.4
Balboa Heights	23.5	333	5 0	-23	(9 20)	-15	9.3	10.5
Georgetown	51.5	352	9 9	- 8	16 53	+15 e	24.1	—
Washington	51.5	352	9 8	- 9	16 40	+ 2 e	27.3	—
Harvard N.	54.4	358	e 9 44	+ 9	17 28	+14 e	29.5	—
Chicago	56.4	345	9 48	0	17 34	- 5	27.2	—
Toronto	56.5	351	—	—	—	e	25.1	—
Ottawa	57.7	355	11 30	?	18 12	+17 e	25.0	—
Berkeley	70.6	320	—	—	—	e	34.3	—
San Fernando	76.3	48	12 48	+51	—	—	49.0	54.0
Coimbra E.	76.5	43	12 8	+10	22 22	+39 e	39.7	45.4
N.	76.5	43	—	—	—	e	38.0	45.9
	76.5	43	12 0	+ 2	22 30	+47	41.3	45.4
Victoria	77.1	328	21 33	?S	(21 33)	-17	37.8	47.6
Tortosa	82.9	46	11 33	-62	—	e	38.0	49.8
Oxford	86.2	35	—	—	23 16	-16	42.5	49.8
Stonyhurst	86.5	34	23 30	?S	(23 30)	- 6	—	—
	86.5	34	30 30	?SR ₁	40 0	?	45.5	49.5
Kew	86.6	35	46 0	?L	—	—	(46.0)	53.0
Eskdalemuir	86.7	31	—	—	e 23 19	-19	38.8	—
Edinburgh	87.0	31	—	—	23 25	-16	48.0	49.3
Uccle	89.1	39	—	—	e 23 30	-34	—	48.0
Moncalieri	89.3	43	e 23 6	?S	(23 6)	-60	45.0	58.8
De Bilt	90.0	38	23 43	?S	(23 43)	-31 e	47.0	49.6
Strasbourg	90.4	40	13 18	0	—	—	—	51.6
Rocca di Papa	91.9	48	—	—	—	—	e 55.8	—
Hamburg	93.3	36	e 17 22	?PR ₁	—	—	e 48.7	53.0
Helwan	104.8	62	26 0	?S	(26 0)	-40	—	—
Riverview	121.3	219	e 34 2	?	—	—	e 53.3	55.8
Colombo	148.8	98	93 0	?L	—	—	(93.0)	—

Additional records: La Paz gives $T_0 = 18h.41m.8s.$ Balboa Heights records
S as L and gives $S = +7m.40s.$ Georgetown LE = +33.3m., LN =
+33.5m. Harvard SE? = +17m.46s., eE = +28m.6s., eE = +29m.46s.
Chicago L = +31.0m. Toronto eL = +29.9m. and +35.3m. San
Fernando MN = +50.5m. Coimbra gives a set of Milne readings in addi-
tion to its usual set. Moncalieri gives S as P and S +34m.52s., MN =
+55.0m. De Bilt e = +25m.37s., MN = +51.7m. Helwan PN =
+28m.0s. Riverview MN = +55.0m.

Feb. 28d. 19h. 49m. 15s. Epicentre $45^{\circ}0'N$, $11^{\circ}5'E$. (as on 1918 Nov. 10d.).

A = +.693, B = +.141, C = +.707.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.
Padova	0.5	0 16	+ 8	0 29	+15
Zurich	3.1	e 0 43?	- 6	i 1 18	- 8
Strasbourg	4.4	—	—	e 1 50	-11
La Paz	94.5	38 26	?L	—	—

No additional records.

Feb. 28d. Records also at 0h. (La Paz), 4h. (near Tacubaya; and Moncalieri),
7h. and 8h. (La Paz), 12h. (Stonyhurst), 15h. (Strasbourg, Balboa
Heights, Tacubaya, and La Paz), 16h. (Stonyhurst, La Paz, Toronto,
Uccle, and Helwan), 17h. (Granada), 19h. (Stonyhurst), 20h. (Riverview,
Paris, and La Paz), 21h. (Taihoku), 22h. (near Mizusawa).

Feb. 29d. Records at 0h. (San Fernando), 5h. (La Paz), 6h. (La Paz, Monte
Cassino, and Batavia), 11h. (Helwan and Apia), 13h. (La Paz), 15h.
(Port au Prince), 17h. (La Paz (2) and Helwan), 19h. (Helwan), 21h.
(Monte Cassino), 22h. (Batavia).

Mar. 1d. Records at 4h. (La Paz), 7h. (near Tokyo), 10h. (near Taihoku, Hokoto,
and Helwan), 11h. (La Paz, Chicago, Coimbra, Melbourne, Riverview,
and Sydney), 12h. (Helwan), 15h. (Stonyhurst), 17h. (Stonyhurst (2)),
21h. (San Fernando).

Mar. 2d. Records at 1h. (near La Paz), 4h. (La Paz), 10h. (Colombo), 16h. (near Batavia), 20h. (near Tokyo), 21h. (San Fernando), 22h. (near Manila).

Mar. 3d. 10h. 43m. 25s. Epicentre $8^{\circ}0'S$. $127^{\circ}5'E$. (as on 1920 Jan. 20d.).

$$A = -.603, B = +.786, C = -.139; \quad D = +.793, E = +.609; \\ G = +.085, H = -.110, K = -.990.$$

The deep focus (0.030) is retained, as on 1920 Jan. 20d.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m.	s.	m.	s.	m.	m.
Batavia	-1.2	20.6	274	4	30	-	4	8	20
Manila	-1.5	23.5	344	5	35	+30	—	+10	—
Melbourne	-2.2	33.7	156	—	—	—	—	-6	—
Riverview	-2.2	33.8	142	e 14	0	? SR ₁	—	—	—
Helwan	-4.4	99.4	300	61	35	? L	—	—	—
								(61.6)	—

Additional records: Manila gives MN = +10.1m. Riverview e(S?) = +17m.0s., MZ = +18.7m.

Mar. 3d. Records also at 2h. (Mizusawa), 5h. (La Paz), 11h. (near La Paz), 12h. (Riverview), 13h. (near Mizusawa).

Mar. 4d. Records at 4h. (near Manila), 8h. (near Osaka and Kobe), 16h. (La Paz), 22h. (Stonyhurst and Helwan).

Mar. 5d. Records at 1h. (near Batavia), 12h. and 13h. (Apia), 16h. (La Paz), 17h. (near Tacubaya).

Mar. 6d. Records at 8h. (Taihoku), 15h. (Helwan), 17h. (Manila and Riverview), 18h. (Helwan), 23h. (San Fernando).

Mar. 7d. Records at 2h. (near Florence), 4h. (La Paz), 5h. (near Athens), 6h. (La Paz), 8h. (near Tacubaya), 19h. (near Pompeii), 22h. (near La Paz).

Mar. 8d. 15h. 14m. 41s. Epicentre $43^{\circ}8'N$. $11^{\circ}2'E$ (Florence), (as on 1919 July 8d.).

$$A = +.708, B = +.140, C = +.692; \quad D = +.194, E = -.981; \\ G = +.679, H = +.134, K = -.722.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m.	s.	m.	s.	m.	m.
Florence	0.0	—	0	0	0	—	—	0.1
Padova	1.7	17	0	32	+6	0	51	+3
Rocca di Papa	2.3	152	0	23	-13	—	—	—
Zurich	4.0	332	e 1	3	+1	e 1	42	-8
Strasbourg	5.3	334	e 1	23	+1	e 2	23	-2

Additional records: Florence gives two other PN's at +1s. and +3s. Zurich eE = +1m.9s., eV = +1m.8s.

Mar. 8d. Records also at 2h. (De Bilt), 3h. (Helwan), 5h. (near La Paz, near Tokyo, and Mizusawa), 10h. (Helwan), 12h. (near Taihoku), 15h. (2) and 16h. (Florence), 19h. (near La Paz and near Tokyo), 20h. (San Fernando).

Mar. 9d. 4h. 34m. 20s. Epicentre $17^{\circ}\text{N. } 97^{\circ}\text{W.}$ (as on 1919 April 19d. 2h.).

$$A = -.117, B = -.949, C = +.292; \quad D = -.992, E = +.122; \\ G = -.036, H = -.290, K = -.956.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tacubaya	3.2	319	0 45	- 5	—	—	2.7	3.0
Chicago	26.1	19	6 7	+18	10 52	+28	12.9	—
Washington	28.0	34	—	—	—	—	e 15.7	—
Toronto	30.5	27	—	—	—	—	17.6	—
Ottawa	33.5	29	—	—	—	—	17.7	—
Victoria	38.0	331	—	—	—	—	—	17.2

Tacubaya gives MN = +3.4m.

Mar. 9d. Records also at 2h. (Algiers), 12h. (near Tokyo), 16h. (Helwan), 17h. (La Paz), 20h. (San Fernando), 23h. (Capetown, Colombo, and Helwan).

Mar. 10d. Records at 3h. (near Tokyo and Mizusawa), 4h. (near Tokyo (2)), 8h. (near Athens), 11h. (Riverview), 16h. (Tacubaya, Chicago, Toronto, Georgetown, and Ottawa), 17h. and 18h. (Batavia).

Mar. 11d. 11h. 46m. 55s. Epicentre $53^{\circ}\text{S. } 148^{\circ}\text{E.}$

$$A = -.501, B = +.313, C = -.807; \quad D = +.530, E = +.848; \\ G = +.684, H = -.428, K = -.591.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Melbourne	16.1	351	—	—	6 11	-46	6.9	7.3
Adelaide	20.0	337	4 53	+12	8 53	+30	10.2	11.4
Riverview	20.1	8	e 4 43	+ 1	i 8 26	+ 1	e 9.7	11.6
Sydney	20.1	8	4 35	- 7	8 23	- 2	10.0	11.3
Perth	31.7	301	7 25	?PR ₁	11 57	- 6	14.2	—
Batavia	58.0	310	—	—	e 18 5	+ 6	—	—
Manila	72.2	334	—	—	—	—	e 81.1	—
Kodaikanal	87.1	291	43 5	?L	—	—	(43.1)	—
Honolulu	88.3	50	e 43 35	?L	—	—	52.1	57.6
Simla	104.6	303	48 23	?L	—	—	(48.4)	—
Victoria	126.4	55	—	—	—	—	—	66.8
Helwan	129.2	270	66 5	?L	—	—	(66.1)	—
Kingston	130.3	120	—	—	—	—	93.1	—
De Bilt	157.8	281	—	—	—	—	e 77.6	101.7

Additional records and notes: Adelaide—These records have all been corrected by +3m. Riverview gives also PS = +8m.38s., MN = +10.8m., MZ = +12.7m. Sydney gives its records as at 1h. Helwan PN = +68m.5s. De Bilt MN = +101.6m.

Mar. 11d. 18h. 32m. 54s. Epicentre $30^{\circ}\text{S. } 179^{\circ}\text{W.}$ (as on 1919 April 17d.).

$$A = -.864, B = -.015, C = -.503; \quad D = -.018, E = +1.000; \\ G = +.503, H = +.009, K = -.864.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	25.5	254	e 5 52	+ 9	e 10 9	- 4	e 13.1	15.1
Sydney	25.5	254	10 6	?S	(10 6)	- 7	13.7	16.1
Honolulu	55.4	25	29 6	?L	—	—	31.1	37.6
Victoria	93.0	34	—	—	—	—	—	47.9
La Paz	98.7	116	e 18 58	?PR ₁	—	—	—	—
De Bilt	E. 157.9	353	—	—	—	—	e 71.1	75.0
	N. 157.9	353	—	—	—	—	e 73.1	74.6
Uccle	159.2	354	—	—	—	—	e 71.1	—

No additional records.

Mar. 11d. Records also at 0h. (San Fernando), 5h. (Melbourne and Riverview), 7h. (La Paz).

Mar. 12d. 15h. 20m. 15s. Epicentre $6^{\circ}5'N$. $128^{\circ}0'E$. (as on 1919 April 16d.).

$$A = -.612, B = +.783, C = +.113; \quad D = +.788, E = +.616; \\ G = -.070, H = +.089, K = -.994.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	10.7	320	—	—	—	—	e 5.3	—
Zi-ka-wei	25.5	346	e 6 41	+58	—	—	—	—
Adelaide	42.6	166	15 21	?S	(15 21)	+38	22.6	24.7
Riverview	45.9	151	—	—	e 18 21	?SR ₁	e 24.3	27.4
Melbourne	47.0	161	—	—	—	—	—	38.8
Kodaikanal	50.1	279	39 45	?	—	—	—	—
Honolulu	72.7	70	24 45	?SR ₁	—	—	33.5	41.2
Helwan	92.6	301	48 45	?L	—	—	(45.8)	—
Victoria	97.2	40	—	—	—	—	66.7	45.5
Hamburg	100.8	329	—	—	—	—	e 58.8	—
De Bilt	104.0	329	—	—	—	—	e 55.8	70.0
Uccle	105.1	327	—	—	—	—	e 55.8	—
Moncalieri	105.9	321	—	—	—	—	e 59.2	69.9
Coimbra	118.5	323	—	—	—	—	e 73.3	—
San Fernando	119.4	319	33 45	?	—	—	78.8	—
Toronto	124.1	24	—	—	—	—	67.7	—
La Paz	161.3	124	i 20 10	[+ 1]	—	—	77.8	—

Additional records: Manila gives its records 1h. late. Adelaide S = +19m.57s. (?SR₁). Helwan PE = +65m.45s. De Bilt MN = +64.5m.

Mar. 12d. Records also at 2h. (La Paz, Riverview, Manila, and Taihoku), 3h. (San Fernando and Helwan), 13h. (Tacubaya), 15h. (near Rocca di Papa), 17h. (La Paz and Tacubaya), 18h. (Victoria, Moncalieri, Toronto, and Berkeley), 19h. (De Bilt and La Paz), 21h. (near Oaxaca), 22h. (near Tacubaya and La Paz).

Mar. 13d. 3h. 58m. 55s. Epicentre $11^{\circ}5'N$. $144^{\circ}0'E$. (as on 1920 Jan. 15d.).

$$A = -.793, B = +.576, C = +.199; \quad D = +.588, E = +.809; \\ G = -.161, H = +.118, K = -.980.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	45.8	172	e 8 41	+ 2	e 15 23	- 2	e 22.4	27.4
Sydney	45.8	172	21 41	?	—	—	25.3	27.4
Adelaide	46.7	186	—	—	—	—	—	35.5
Melbourne	49.3	180	—	—	—	—	30.8	34.9
Apia	50.6	118	9 6	- 5	—	—	10.4	—
Honolulu	56.2	72	22 47	?SR ₁	i 28 59	?	e 29.1	33.1
Victoria	83.2	42	—	—	—	—	41.8	48.7
Helwan	103.2	304	43 5	?L	—	—	(43.1)	—
Toronto	112.1	32	—	—	—	—	e 65.9	69.0
San Fernando	124.5	331	61 5	?L	—	—	(61.1)	—
La Paz	148.4	103	e 19 46	[- 7]	31 36	?	55.3	64.5

Additional record and notes: Riverview gives MN = +26.5m. Apia e = +9m.31s. Helwan PN = +46m.5s. La Paz i = +20m.36s., T₀ = 4h.4m.41s.

Mar. 13d. 10h. 39m. 40s. Epicentre $24^{\circ}0'N$. $123^{\circ}0'E$. (as on 1919 May 16d.).

$$A = -.498, B = +.766, C = +.407; \quad D = +.839, E = +.545; \\ G = -.224, H = +.341, K = -.913.$$

	Δ °	Az. °	P. m. s.	O-C. s.	L. m.	M. m.
Taihoku	1.7	308	0 30	+ 4	0.9	0.9
Hokoto	3.2	262	0 17	-33	0.8	—
Zi-ka-wei	7.3	349	e 1 36	-15	—	—
Manila	9.6	192	e 2 20	- 4	—	—
Tokyo	18.6	47	3 22	-62	4.5	4.6
Batavia	34.1	209	e 7 15	+ 9	—	8.9
Helwan	79.7	298	33 20	?L	(33.3)	—
De Bilt	86.7	327	—	—	e 45.3	48.2
Uccle	87.8	326	—	—	e 45.3	—
Coimbra	101.6	324	—	—	e 56.0	—

Batavia gives its record as at 11h.

Mar. 13d. Records also at 0h. (La Paz and near Mizusawa), 1h. (Helwan), 5h. (Riverview, Colombo, Hamburg, Uccle, and De Bilt), 8h. (Riverview and Melbourne), 10h. (La Paz and Helwan), 11h. (Helwan), 12h. (Denver and near Tokyo), 13h. (Helwan), 14h. (Tokyo), 15h. (Taihoku), 16h. (near Tokyo), 21h. and 22h. (La Paz).

Mar. 14d. Records at 2h. (Azores and La Paz), 3h. and 4h. (Helwan), 5h. (San Fernando), 9h. (Riverview), 11h. (Helwan), 12h. (near Mizusawa), 13h. (La Paz and San Fernando), 18h. (near Tokyo and Mizusawa), 19h. (San Fernando), 20h. (near Tokyo).

1920. Mar. 15d. 12h. 5m. 30s. Epicentre 20-0S. 176-5E.

A = -0.938, B = +0.057, C = -0.342; D = +0.061, E = +0.998;
G = +0.341, H = -0.021, K = -0.940.

A focal depth 0.030 is assumed.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Apia	-0.6	12.8	63	i 3 0	- 2	—	—	5.6	12.5
Riverview	-1.7	26.4	233	e 5 33	- 2	i 9 52	- 5	e 11.6	13.8
Sydney	-1.7	26.4	233	6 0	+25	9 42	-15	9.7	14.1
Melbourne	-2.2	32.6	230	—	—	8 6	?	12.5	15.0
Adelaide	-2.4	36.6	239	6 24	-43	12 42	- 1	17.4	22.0
Honolulu	-3.0	48.2	34	i 15 48	? S	15 48	+30	e 25.0	29.3
Perth	-3.4	55.2	245	3 40	?	—	—	—	—
Manila	-3.7	64.7	300	e 10 30	+11	—	—	—	—
Osaka	-3.7	67.2	326	e 11 22	+47	—	—	—	31.8
Batavia	-3.8	68.8	273	e 10 52	+ 7	—	—	—	22.8
Taihoku	-3.8	69.9	310	—	—	19 30	- 8	30.8	—
Zi-ka-wei	-3.9	73.6	315	e 10 54	-21	e 20 24	+ 2	—	—
Berkeley	-4.0	81.5	46	—	—	—	—	e 33.9	—
Lick	-4.0	81.7	47	—	—	—	—	e 36.6	—
Victoria	-4.1	86.6	38	13 55	+81	22 46	- 8	34.1	43.4
Colombo	-4.4	98.6	275	44 30	? I.	—	—	(44.5)	55.5
Kodaikanal	-4.4	102.0	277	36 36	?	—	—	—	—
La Paz	-4.5	106.8	117	18 42	? PR ₁	e 28 42	+144	45.5	60.0
Chicago	-4.5	107.4	51	26 50	? S	33 50	? SR ₁	47.5	—
Mauritius	E. -4.5	107.7	240	30 24	?	—	—	—	59.0
Toronto	-4.6	113.7	50	19 36	? PR ₁	29 12	+112	56.6	66.3
Georgetown	-4.6	114.0	56	—	—	—	—	58.6	—
Washington	-4.6	114.9	56	—	—	—	—	e 57.5	—
Ithaca	-4.6	115.6	51	—	—	—	—	e 58.9	—
Ottawa	E. -4.6	116.4	48	e 24 8	?	e 35 0	? SR ₁	54.5	—
Harvard	-4.7	119.6	51	29 41	? S	31 29	+200	e 57.0	—
Hamburg	—	144.9	346	—	—	—	—	e 60.5	73.5
Helwan	—	147.1	294	41 30	? SR ₁	—	—	—	—
De Bilt	E. -	147.2	349	—	—	e 41 29	? SR ₁	e 58.5	72.3
Vienna	N. -	147.2	349	—	—	—	—	e 67.5	81.8
Kew	—	147.5	335	i 19 25	[-27]	—	—	e 57.5	81.5
Uccle	—	148.4	358	—	—	—	—	—	93.5
Strasbourg	—	148.6	350	e 19 24	[-30]	e 41 42	?	e 58.5	82.5
Paris	—	150.0	343	e 19 27	[-29]	e 31 55	?	82.5	—
Florence	—	150.8	352	e 19 33	[-24]	—	—	80.5	—
Moncalieri	—	153.2	336	—	—	—	—	60.5	64.5
Puy de Dome	—	153.4	343	40 11	? SR ₁	52 46	?	63.5	84.5
Coimbra	—	153.8	350	20 7	[+ 6]	—	—	—	—
Algiers	—	159.4	11	49 30	?	—	—	—	—
San Fernando	—	162.3	343	—	—	—	—	78.5	92.5
	—	163.4	8	—	—	—	—	90.3	103.5

Additional records and notes: Apia gives $T_0 = 12h.5m.20s.$ Epicentre $18^\circ-0S.$
 $174^\circ-0E., \Delta = 14^\circ.5.$ Riverview gives $MN = +11.9m., MZ = +13.4m.$
 Adelaide gives its record apparently 10m. too soon, $PR_1 = +8m.6s.$ Hono-
 lulu $iS = +19m.12s.$ and $e = +11m.30s.$ Osaka $MN = +32.3m.$
 Zi-ka-wei gives its readings at 11h. Mauritius $PN = +30m.12s., MN$
 $= +45.3m.$ Toronto $e = +25m.45s., e = +33m.30s., eL = 59.2m.$
 Georgetown $LN = +59.6m.$ Ithaca $eLN = 57.9m.$ Ottawa $eE =$
 $+30m.12s., T_0 = 12h.16m.43s.$ Harvard $eSE = +36m.37s., L = +60.2m.,$
 $L = +69.6m.$ Eskdalemuir ($\Delta = +144.^\circ 7$) gives 12h. to 13h. Helwan
 $P = +35m.30s.$ Moncalieri $MN = +86.8m.$

Mar. 15d. Records also at 1h. (near Tacubaya), 3h. and 7h. (Helwan), 8h. (Tacubaya), 10h. (Kodaikanal), 14h. (Mauritius), 17h. (Sydney, Riverview, and near Tokyo), 19h. (Helwan), 20h. (La Paz).

Mar. 16d. Records at 1h. (Simla), 4h. (near Balboa Heights), 5h. (La Paz), 9h. (Manila), 10h. (Apia), 11h. (Apia, Helwan, and near Taihoku (2)), 12h. (near Athens), 13h. (La Paz and Tokyo), 15h. (Helwan), 19h. (La Paz), 20h. (Helwan).

1920. Mar. 17d. 18h. 36m. 50s. Epicentre 2°·0N. 96°·0E.

$\Delta = -.104$, $B = -.994$, $C = +.035$; $D = -.995$, $E = -.104$;

$G = -.004$, $H = +.035$, $K = -.999$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia		13·6	127	e 3 27	+ 6	7 18	? L	e 19·2	8·7
Colombo		16·9	287	7 52	?S	(7 52)	+36	11·4	13·2
Kodaikanal		20·2	295	8 16	?S	(8 16)	-11	10·8	13·4
Calcutta	E.	21·8	341	4 16	-47	8 16	-45	—	—
	N.	21·8	341	4 10	-53	8 10	-51	—	—
Manila		27·7	62	e 6 10	+ 5	(10 49)	- 5	10·8	11·3
Bombay		28·3	308	6 15	+ 4	—	—	—	21·9
Zi-ka-wei		37·8	38	e 7 39	+ 3	e 13 31	- 4	—	23·6
Perth		38·8	153	—	—	14 10	+21	—	—
Mauritius		41·3	236	9 52	+107	—	—	—	—
Melbourne		60·2	138	—	—	—	—	e 33·2	41·7
Riverview		63·0	131	e 23 26	?SR ₁	—	—	e 32·2	34·7
Helwan	E.	67·1	302	20 4	?S	(20 4)	+13	—	43·0
	N.	67·1	302	20 52	?S	(20 52)	+61	—	38·4
Cape Town		78·5	234	46 35	?L	—	—	(46·6)	53·8
Vienna		81·6	320	i 12 30	+ 2	i 22 44	+ 2	—	55·2
Rocca di Papa		83·7	312	12 40	0	—	—	—	12·9
Hamburg		86·0	324	e 12 53	0	—	—	e 47·2	63·2
Moncalieri		87·4	315	23 24	?S	(23 24)	-21	50·3	—
De Bilt	E.	88·9	322	—	—	e 23 37	-25	e 53·2	58·7
	N.	88·9	322	—	—	—	—	e 48·2	61·4
Uccle		89·6	321	e 13 10	- 4	e 24 4	- 6	e 49·2	—
Chicago		136·1	4	i 23 10	?PR ₁	35 22	?SR ₁	e 69·2	—
La Paz		158·7	226	20 17	[+10]	—	—	73·2	76·0

Additional records and notes: Colombo gives $S = +9m.46s.$ Manila $S = +9m.37s.$, $MN = +11.4m.$ Zi-ka-wei $MN = +24.2m.$ Mauritius $PE = +10m.40s.$ Riverview $MN = +37.5m.$ Hamburg $MN = +61.2m.$ Moncalieri S is given as P and $S = +36m.51s.$ Chicago $L = +80.2m.$

Mar. 17d. Records also at 1h. (San Fernando), 12h. (near La Paz), 18h. (near Tortosa), 20h. (Batavia and near Tokyo), 22h. (Batavia), 23h. (Manila).

Mar. 18d. Records at 1h. (near Batavia), 3h. (San Fernando), 6h. (La Paz), 7h. (near Batavia), 12h. (San Fernando), 13h. and 14h. (La Paz), 22h. (Apia).

Mar. 19d. Records at 1h. (near Balboa Heights), 2h. (near Mizusawa and Tokyo), 6h. (Apia, La Paz, and Riverview), 8h. (Helwan), 10h. (Kodaikanal), 12h. (La Paz), 14h. (Apia), 17h. (Washington, Georgetown, Chicago, and Ottawa), 18h. (Manila), 20h. (near Tokyo), 21h. (La Paz (2)), 22h. (San Fernando).

Mar. 20d. 17h. 48m. 42s. Epicentre 40°·5N. 122°·0W. (as on 1919 May 20d.).

$\Delta = -.403$, $B = -.645$, $C = +.649$; $D = -.848$, $E = +.530$;

$G = -.344$, $H = -.551$, $K = -.760$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Berkeley	N.	2·6	186	e 0 37	- 4	e 1 4	- 8	1·2	2·2
	Z.	2·6	186	—	—	e 1 5	- 7	1·2	2·6
Lick		3·1	174	e 0 48	- 1	e 1 25	- 1	e 1·6	2·7
Victoria		8·0	354	—	—	—	—	3·3	4·8
Tucson	E.	12·1	130	5 53	?S	(5 53)	+32	(7·9)	—
Denver		13·0	88	—	—	—	—	7·3	8·3
Chicago		25·8	76	10 28	?S	(10 28)	+10	14·4	—

Continued on next page.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Toronto		31.4	70	—	—	20 54	?	23.7	—
Ottawa		33.5	65	—	—	e 12 10	-22	e 21.0	—
Ithaca		33.7	71	—	—	—	—	e 15.3	—
Georgetown	E.	34.2	79	e 15 45	?	19 23	?	e 21.6	—
	N.	34.2	79	e 15 23	?	19 23	—	e 21.1	—
Washington		34.2	79	—	—	—	—	e 14.3	—
Cheltenham		34.4	79	8 54	?PR ₁	19 18	?L	(19.3)	—
Harvard	E.	37.6	70	16 41	?	—	—	23.2	—
	N.	37.6	70	16 33	?	20 8	?	21.5	23.5
Eskdalemuir		71.0	31	—	—	—	—	30.3	—
Kew		75.0	33	—	—	—	—	—	90.3
De Bilt		76.7	30	—	—	e 21 48	+ 3	e 34.3	38.1
Uccle		77.4	30	—	—	—	—	e 34.3	—
Strasbourg		80.5	32	—	—	—	—	e 41.3	—

Additional records and notes: Berkeley gives E records coinciding with N or Z, ME = 2.5m., T₀ = 17h.48m.43s. Lick MN = +2.3m., T₀ = 17h.48m.43s. Tucson PN = +7m.23s. Chicago S? = +13m.13s. Ottawa e = +18m.48s. Georgetown LE = +22.8m., eLZ = +21.6m., LZ = +25.6m. Harvard iN = +16m.44s., eN = +18m.4s., iE = +20m.40s., LE = +24.1m. De Bilt MN = -38.4m.

1920. Mar. 20d. 18h. 31m. 15s. Epicentre 35°·8S. 109°·4W.

A = -.269, B = -.765, C = -.585; D = -.943, E = +.332;
G = +.194, H = +.552, K = -.811.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz		41.3	74	i 8 5	0	i 14 27	+ 2	17.5	18.4
Balboa Heights	E.	52.9	39	9 23	- 2	17 5	+10	25.0	28.8
	N.	52.9	39	—	—	—	—	24.8	27.0
Oaxaca		54.2	14	9 32	- 2	17 11	0	25.6	26.6
Tacubaya	E.	55.9	11	10 49	+64	18 38	+65	27.4	31.1
	N.	55.9	11	10 47	+62	18 37	+64	27.5	31.2
Christchurch		58.3	237	—	—	—	—	27.8	34.8
Mazatlan		59.1	4	13 41	?PR ₁	—	—	—	—
Apia		59.7	276	—	—	e 18 9	-10	28.8	—
Tucson	E.	68.1	358	20 6	?S	(20 6)	+ 3	27.8	29.2
Vieques	E.	68.2	45	13 27	?PR ₁	20 21	+17	32.6	33.6
	N.	68.2	45	11 41	+36	20 23	+19	35.2	38.2
Honolulu		73.4	313	—	—	i 22 3	+56	37.6	41.4
Berkeley		74.6	350	e 11 46	0	—	—	—	—
Riverview		77.6	237	e 12 27	+22	(23 15)	+79	e 33.0	36.6
Sydney	E.	77.6	237	12 3	- 2	22 15	+19	35.8	42.0
Melbourne		79.3	230	19 45	?	27 45	?SR ₁	38.8	44.8
Chicago		80.1	16	i 12 22	+ 2	22 20	- 4	51.8	—
Georgetown	E.	80.4	25	e 12 18	- 3	e 22 28	0	39.9	—
	N.	80.4	25	e 12 11	-10	i 22 25	- 3	e 40.8	—
	Z.	80.4	25	e 12 3	-18	22 34	+ 6	e 36.0	—
Washington		80.4	25	e 12 15	- 6	22 28	0	35.8	—
Cheltenham	N.	80.4	26	12 37	+16	22 35	+ 7	41.0	44.6
Ann Arbor	E.	81.6	20	14 51	?	23 57	+75	37.6	42.4
	N.	81.6	20	14 57	?	24 21	+99	37.4	38.4
	N.	81.6	20	—	—	23 57	+75	37.6	38.5
Ithaca		83.8	24	e 12 24	-17	22 39	-28	37.2	—
Toronto		84.0	22	11 33	-69	i 23 33	+25	e 46.0	47.4
Victoria		85.1	351	13 52	+63	23 12	- 8	35.0	43.4
Harvard	E.	85.6	27	e 12 47	- 4	23 14	-12	e 35.4	—
	N.	85.6	27	11 46	-65	23 10	-16	41.2	41.8
Northfield		86.6	26	—	—	e 21 45	-112	e 37.8	—
Ottawa		86.7	23	12 49	- 8	23 27	-11	e 37.8	—
Capetown	E.	95.0	140	23 32	?S	25 44	+38	51.9	52.9
Sitka		95.4	346	—	—	—	—	46.5	—
Coimbra		119.7	60	20 26	?PR ₁	31 34	+167	49.8	60.0
San Fernando		119.7	60	20 15	?PR ₁	31 15	+148	48.8	62.8
Rio Tinto		119.7	65	19 38	?PR ₁	—	—	57.2	73.8
Granada		120.0	63	18 45	?PR ₁	—	—	—	43.8
		122.0	65	20 42	?PR ₁	i 33 25	?	—	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mauritius	E.	122.9	166	30 45	?S	(30 45)	+94	—	60.0
	N.	122.9	166	27 57	?S	(27 57)	-74	(54.2)	57.8
Tokyo		125.2	291	20 31	?PR ₁	i 45 14	?	i 56.3	—
Batavia		126.0	225	e 21 1	?PR ₁	—	—	60.0	72.2
Tortosa		126.2	62	e 19 21	[+12]	38 11	?SR ₁	59.6	77.6
Algiers		126.8	67	e 19 36	[+26]	38 1	-98	53.8	67.8
Barcelona		127.6	62	e 21 20	?PR ₁	33 41	?	e 55.7	66.4
Eskdalemuir		127.6	42	e 18 37	[-36]	i 28 15	-89	38.5	—
Edinburgh		127.7	42	e 22 35	?PR ₁	32 45	?	—	65.2
Stonyhurst		127.7	46	30 45	?S	(30 45)	+60	58.8	73.8
Oxford		128.0	48	19 5	[-9]	—	—	—	65.8
Dyce	E.	128.4	40	i 28 30	?S	i 39 20	?SR ₁	53.0	—
	N.	128.4	40	i 28 14	?S	38 39	?SR ₁	55.5	64.0
Kew		128.5	48	—	—	—	—	—	74.8
Puy de Dôme		129.4	55	21 58	?PR ₁	—	—	—	—
Paris	E.	129.8	51	e 22 50	?PR ₁	e 35 17	?	58.8	61.8
	N.	129.8	51	e 23 21	?PR ₁	e 35 9	?	—	75.8
Uccle		131.3	49	e 19 27	[+6]	—	—	e 58.8	64.3
De Bilt		131.9	47	e 20 8	[+45]	—	—	e 62.8	67.9
Moncalieri		132.5	59	e 19 59	[+35]	33 55	?	49.0	76.4
Strasbourg		133.0	52	e 19 26	[+1]	—	—	e 63.8	67.4
		133.0	52	e 19 53	[+28]	—	—	—	73.1
Florence		134.7	60	25 3	?PR ₁	40 15	?SR ₁	54.8	65.6
Rocca di Papa	N.	135.3	64	e 19 51	[+21]	39 57	?SR ₁	e 67.6	81.6
Padova		135.4	59	20 45	[+74]	29 26	?	—	—
Pompeii		136.4	64	22 45	?PR ₁	—	—	76.8	—
Hamburg		136.9	46	e 19 28	[-6]	—	—	e 63.8	64.8
Vienna		138.8	52	i 23 33	?PR ₁	—	—	e 40.8	74.8
Budapest		140.5	55	e 20 39	[+59]	—	—	—	—
Helwan	E.	146.7	88	31 51	?	—	—	—	89.6
	N.	146.7	88	33 57	?	—	—	—	89.8
Colombo		149.9	197	—	—	41 15	?SR ₁	76.2	95.8
Kodaikanal		153.6	195	53 9	?	—	—	82.4	95.8
Bombay		163.0	187	23 33	?PR ₁	—	—	—	—
Simla		172.8	231	e 29 33	?	—	—	47.8	86.6

Additional records and notes: La Paz gives PR₁ = +9m.37s., T₀ = 18h.31m.17s. Oaxaca records have all been increased by 3min. Christchurch SR₁? = +19m.3s., SR₂? = +21m.57s. Apia i = +25m.9s. Honolulu i = +30m.57s. = SR₁?. Riverview PS = +23m.15s. (taken as S), SR₂ = +26m.58s., MZ = +43.0m. Melbourne PR₁ = +22m.33s. Cheltenham SE = +22m.30s. Washington L = +40.8m. and 42.8m. Ithaca PR₁N = +15m.49s., SN = +22m.49s., L? = +34.8m. Toronto L = +36.4m., eL = +60.8m. and +71.8m., L (repetition) = 20h.45m.30s. Epicentre 23° 48S. 163° 0W. (approx.). Victoria L (repetition) = 21h.5m.23s. Harvard iE = +24m.17s., iN = +24m.11s., SR₁N = +29m.5s. ME(repetition) = 20h.43m.46s. Ottawa SR₁E = +29m.15s., T₀ = 18h.31m.23s. Coimbra PR₁ = +30m.20s., SR₁ = +36m.45s., iE = +37m.14s., LN = +49.8m., MN = +62.8m., T₀ = 18h.13m.28s. San Fernando MN = +68.8m. Granada SR₁ = +37m.25s. Batavia i = +28m.9s. and many other L's and M's. Barcelona ? = +38m.41s., MN = +69.0m. Eskdalemuir i = +31m.20s. Edinburgh SR₁ = +38m.41s., SR₂ = +43m.9s. Stonyhurst S = +39m.33s., L = +42.2m. The actual L is recorded as the P of a second shock, to which M also belongs. Dyce iN = +39m.10s. Uccle i = +21m.38s., PR₁ = +22m.52s., eSR₁ = +37m.45s., MN = +75.2m. De Bilt eE = +21m.41s., e = +22m.54s. and +39m.14s., m = +40m.4s., MN = +78.6m. Moncalieri MN = +74.9m. Strasbourg ePN = +22m.2s. and +23m.45s. Hamburg iE = +22m.37s. and +40m.39s. Colombo L = +93.8m.

Mar. 20d. Records also at 0h. (Toronto, Victoria, La Paz, and near Tokyo), 1h. (near Batavia), 3h. (near Tokyo), 6h. (Perth), 7h. (near Tokyo), 10h. (near Tacubaya), 12h. (Apia), 14h. (Batavia (2)), 16h. (Apia and near Mizusawa), 17h. (La Paz and near Victoria).

Mar. 21d. Records at 0h. (La Paz, Helwan, Moncalieri, and near Granada and Tortosa), 1h. (Uccle and De Bilt), 4h. (San Fernando), 5h. (Taihoku), 10h. (Helwan), 16h. (La Paz), 19h. (Zi-ka-wei), 20h. (Manila), 21h. (Melbourne, San Fernando, and Riverview), 23h. (Riverview).

Mar. 22d. 1h. 38m. 33s. Epicentre $8^{\circ}08'. 160^{\circ}00'E.$ (as on 1917 Nov. 22d.).

A = -·931, B = +·339, C = -·139; D = +·342, E = +·940;

G = +·131, H = -·048, K = -·990.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	27·1	196	e 6 1	+ 2	e 10 40	- 3	e 13·8	15·6
Melbourne	32·8	202	—	—	—	—	e 18·0	20·0
Manila	44·8	300	e 9 27	+55	—	—	—	—
Perth	47·4	233	15 47	?S	(15 47)	+ 1	25·2	—
Honolulu	50·5	54	e 17 51	?S	(17 51)	+86	e 24·2	34·4
Victoria	87·3	40	—	—	—	—	—	44·5
Chicago	111·9	48	—	—	—	—	e 54·4	—
Toronto	117·4	45	—	—	—	—	42·0	—
Ottawa	118·4	42	—	—	—	—	63·4	—
De Bilt	131·3	340	—	—	e 40 26	?SR ₁	e 70·4	78·4
Uccle	132·6	339	—	—	—	—	e 68·4	88·4
Tortosa	142·4	334	e 19 27	[-17]	—	—	e 79·4	99·8
San Fernando	148·9	338	48 27	?SR ₁	—	—	—	—

Additional records and notes: Riverview gives SR₁ = +12m.13s., MN = +19·8m.
 Honolulu gives S as eP and S = +22m.9s. Toronto
 L(?SR₁) = +22m.9s., L_u = +70·6m. and +109·0m. Ottawa L = +71·4m.
 and +87·4m. De Bilt ePR₁N = +23m.27s., MN = +88·2m.

Mar. 22d. 20h. 1m. 43s. Epicentre $17^{\circ}08'. 177^{\circ}50'W.$ (as on 1920 Jan. 30d.).

A = -·955, B = -·042, C = -·292; D = -·044, E = +·999;

G = +·292, H = +·013, K = -·959.

On each previous occasion, viz., on 1918 May 22d. and 1919 Aug. 18d. (2), when this epicentre was adopted a considerable depth of focus was found necessary for the determination. In the present instance a depth 0·040 is assumed, both agreeing with precedent and satisfying the present observations.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia		0·0	6·3	61	1 36	0	2 52	3·3	4·3
Riverview		-2·8	32·7	232	e 6 12	-15	e 11 23	- 9	e 13·0
Sydney	E.	-2·8	32·7	232	7 17	?PR ₁	11 29	- 3	13·9
Melbourne		-3·2	38·9	230	(e 8 47)	?PR ₁	(13 23)	+17	13·4
Honolulu		-3·5	42·8	29	i 15 47	?SR ₁	i 18 53	?	e 21·3
Perth		-3·8	61·6	242	18 37	?S	(18 37)	+41	33·7
Manila		-4·8	68·4	295	e 10 50	+14	(19 33)	+25	19·6
Batavia		-5·0	74·5	269	11 17	+ 3	—	—	e 41·5
Berkeley		-5·0	75·4	41	—	—	—	—	e 33·9
Victoria		-5·2	81·2	33	20 27	?S	(20 27)	-70	34·7
Chicago		-5·6	101·1	50	e 20 17	?	—	—	50·3
La Paz		-5·7	102·7	112	i 18 23	[-26]	—	—	48·3
Colombo		-5·7	104·1	271	51 53	?L	—	—	(51·9)
Kodaikanal		-5·8	107·3	274	61 5	?L	—	—	(61·1)
Toronto		-5·8	107·3	49	—	—	40 35	?	56·8
Georgetown		-5·8	108·5	53	—	—	—	—	56·3
Ottawa		—	110·1	46	e 28 21	?S	(28 21)	+52	53·3
Cape Town		—	126·9	196	69 47	?L	—	—	(69·8)
Edinburgh		—	140·9	6	—	—	—	—	73·3
Eskdalemuir		—	141·4	6	e 36 15	?	e 40 49	?SR ₁	67·3
Hamburg		—	143·0	353	—	—	—	—	e 78·3
De Bilt	E.	—	144·8	357	e 41 29	?SR ₁	—	—	e 70·3
	N.	—	144·8	357	e 47 11	?	—	—	e 67·3
Kew		—	145·5	3	—	—	—	—	84·3
Uccle		—	146·2	358	e 19 16	[-34]	—	—	e 59·3
Vienna		—	146·8	343	i 19 22	-29	—	—	—
Strasbourg		—	148·1	351	e 19 25	[-28]	—	—	e 72·3
Paris		—	148·2	1	i 19 33	-20	—	—	90·3
Padova		—	150·6	347	19 47	[-10]	—	—	—
Helwan		—	150·7	302	32 17	?	(38 17)	?	—
Puy de Dôme		—	151·3	359	19 40	[-17]	—	—	—
Moncalieri		—	151·7	352	e 20 32	+34	40 38	?	74·8
Rocca di Papa		—	153·7	343	e 19 39	[-22]	—	—	e 26·7
Coimbra	E.	—	154·9	21	45 47	?SR ₁	—	—	e 74·3
	N.	—	154·9	21	45 17	?SR ₁	55 7	?	76·0
Tortosa		—	156·1	5	e 20 0	[- 3]	—	—	73·9
San Fernando		—	159·1	20	—	—	—	—	81·3
Granada		—	159·1	14	e 19 48	[-19]	30 55	?	—

For Notes see next page.

NOTES TO MAR. 22d. 20h. 1m. 43s.

Additional records: Apia gives $18^{\circ}08'$, $178^{\circ}00'W.$, $T_0 = 20h.1m.30s.$, $\Delta 8^{\circ}0'$.
 Riverview PS = $+11m.52s.$, MN = $+14.6m.$, MZ = $+17.6m.$ Toronto
 eL = $+60.4m.$ Ottawa L = $+57.3m.$ and $+73.3m.$ Strasbourg L =
 $+82.3m.$ San Fernando MN = $+90.8m.$ Granada PR₁ = $+20m.29s.$,
 PS = $+22m.51s.$

Mar. 22d. Records also at 0h. (Chicago, Hamburg, Victoria, Helwan, Uccle, and De Bilt), 3h. (Helwan and Batavia), 4h. (Batavia), 5h. (near Tokyo), 7h. (Batavia), 10h. (near Calcutta), 13h. (Helwan), 15h. (Mazatlan and Stonyhurst), 16h. (Stonyhurst), 19h. (Taihoku, La Paz, and Harvard).

Mar. 23d. 15h. 21m. 48s. Epicentre $14^{\circ}5'N.$ $91^{\circ}0'W.$ (as on 1919 July 6d.).

A = -0.17 , B = -0.968 , C = $+0.250$; D = -1.000 , E = $+0.18$;
 G = -0.004 , H = -0.250 , K = -0.968 .

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Oaxaca		6.1	296	1 14	-19	—	—	1.7	2.0
Tacubaya		9.3	304	2 37	+17	—	—	4.1	4.4
Tucson	E.	25.4	318	5 1	-41	—	—	11.9	12.7
	N.	25.4	318	5 7	-35	—	—	12.5	12.6
Cheltenham	E.	27.3	25	6 1	0	11 12	+26	15.5	—
	N.	27.3	25	6 24	+23	11 21	+35	15.5	—
Georgetown		27.3	24	6 17	+16	11 19	+33	13.9	—
Washington		27.3	24	e 5 37	-24	10 52	+6	—	—
Chicago		27.4	6	i 5 36	-26	10 10	-38	14.7	—
Ann Arbor	E.	28.5	12	—	—	11 42	+34	16.1	—
	N.	28.5	12	6 12	-1	11 18	+10	16.1	21.9
	E.	28.5	12	6 6	-7	11 12	+4	16.1	—
Ithaca		30.7	23	—	—	e 13 4	+78	17.6	—
Toronto		30.8	17	3 24	?	10 30	-78	14.6	23.8
Harvard		32.8	28	e 6 14	-41	(12) 51	+30	16.7	19.9
Ottawa		33.5	20	i 6 37	-24	i 11 47	-45	14.7	—
Northfield		33.6	25	—	—	e 12 12	-22	—	—
Berkeley		36.2	316	—	—	—	e 18.0	—	—
La Paz		38.3	143	7 46	+6	13 41	-1	16.9	17.8
Victoria		43.1	329	13 28	?S	(13 28)	-81	21.4	24.9
Honolulu		63.7	287	e 11 0	+24	19 42	+33	29.3	31.2
Coimbra		75.2	52	e 21 12	?S	(e 21 12)	-16	38.2	—
		75.2	52	21 42	?S	(21 42)	+14	35.7	40.2
Edinburgh		76.8	35	—	—	i 21 48	+1	—	—
Eskdalemuir		76.8	36	11 57	-3	21 41	-6	36.9	—
San Fernando		77.3	55	22 12	?S	(22 12)	+20	—	—
Kew		79.2	39	—	—	—	—	—	55.2
Paris		81.4	42	i 12 25	-2	i 22 35	-4	40.2	—
Uccle		82.2	40	e 12 23	-8	22 37	-11	e 39.2	42.6
De Bilt	E.	82.5	38	12 33	0	22 44	-8	39.2	40.7
	N.	82.5	38	—	—	—	—	42.2	44.1
Algiers		84.6	53	e 12 45	-1	22 56	-19	46.2	—
Hamburg		84.7	37	e 12 37	-9	i 22 58	-18	e 45.2	—
Strasbourg		84.9	41	12 38	-9	e 22 57	-21	e 42.2	—
Padova		88.4	43	13 49	+42	—	—	—	—
Rocca di Papa		90.3	47	e 13 10	-8	23 36	+19	—	27.1
Pompeii		91.9	47	—	—	23 48	+14	—	—
Helwan		108.9	51	25 12	?S	(29 12)	?	—	—

Additional records: Oaxaca gives its record 4m. early. Tacubaya MN =
 $+4.7m.$ = MZ. Toronto i = $+12m.36s.$, eL = $+19.3m.$ Harvard S was
 recorded 10min. less, eLN = $+11.5m.$, L = $+12.4m.$ Coimbra S =
 $+27m.26s.$ Pompeii gives its records as 14h.

Mar. 23d. Records also at 0h. (San Fernando), 4h. (Helwan), 6h. (Nagasaki), 16h. (Simla), 20h. (Rocca di Papa), 22h. (Mazatlan).

Mar. 24d. Records at 0h. (Apia, La Paz, San Fernando, and near Mizusawa), 1h. (near Mizusawa), 6h. (Riverview), 9h. and 15h. (La Paz), 16h. (near Tokyo), 17h. (La Paz), 20h. (San Fernando), 21h. (near Tokyo).

Mar. 25d. Records at 0h. (Taihoku), 1h. (Manila, Helwan, and La Paz), 2h. (La Paz), 7h. (near Mizusawa and Tokyo), 12h. (near Rocca di Papa), 18h. (Helwan), 21h. (Batavia and La Paz), 22h. (San Fernando).

Mar. 26d. Records at 18h. (near Pompeii and Rocca di Papa), 20h. (La Paz and Riverview).

Mar. 27d. Records at 0h. (San Fernando), 10h. (near Mizusawa), 11h. (near Rocca di Papa), 13h. (near La Paz (2)), 19h. (La Paz), 20h. (near Port au Prince), 22h. (San Fernando).

Mar. 28d. Records at 0h. (Batavia), 1h. (Colombo and Helwan), 4h. (La Paz), 5h. (La Paz and near Mizusawa), 6h. (La Paz), 11h. (Riverview), 13h. (Helwan, Harvard, and La Paz), 18h. (Rio Tinto), 23h. (Harvard).

1920. Mar. 29d. 5h. 7m. 40s. Epicentre $50^{\circ}5'N$. $129^{\circ}5'W$.

A = -405, B = -491, C = +772; D = -772, E = +636;
G = -491, H = -595, K = -636.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	'	m. s.	s.	m. s.	s.	m.	m.
Victoria		4.5	115	1 35	+25	(2 4)	0	2.1	3.6
	Z.	4.5	115	1 24	+14	—	—	2.8	3.3
Sitka	E.	7.4	334	e 2 15	+23	(e 2 55)	-26	e 2.9	3.9
	N.	7.4	334	—	—	e 3 17	-4	3.8	4.8
Berkeley	N.	13.6	155	e 3 29	+8	—	—	e 6.4	9.1
	E.	13.6	155	e 3 35	+14	—	—	e 6.3	9.6
Lick		14.3	154	e 3 44	+14	—	—	e 7.0	10.8
Denver		20.3	113	4 20	-25	8 20	-9	12.3	14.3
Tucson	E.	22.8	136	5 41	+26	10 7	+46	13.5	15.8
	N.	22.8	136	5 42	+27	—	—	15.6	15.8
Chicago		29.8	91	i 6 28	+2	11 28	-3	14.3	17.3
Ann Arbor	N.	32.1	88	7 8	+20	12 32	+22	17.0	21.2
		32.1	88	—	—	12 26	+16	17.1	20.3
Mazatlan	E.	32.7	140	6 43	-11	—	—	16.7	21.6
	N.	32.7	140	6 40	-14	—	—	16.6	21.5
Toronto		34.1	83	—	—	12 56	+14	e 18.3	19.8
Ottawa		35.5	78	7 15	-3	12 56	-7	17.3	19.3
Ithaca		36.6	82	7 22	-5	13 10	-8	18.3	—
Northfield		38.1	77	8 45	+66	14 13	+34	20.5	—
Washington		38.2	88	7 20	-20	13 20	-21	—	25.8
Georgetown	E.	38.2	88	e 7 35	-5	e 13 25	-16	e 16.7	24.2
	N.	38.2	88	e 7 53	+13	—	—	e 16.8	24.3
	Z.	38.2	88	e 7 35	-5	e 13 47	+6	—	23.8
Cheltenham	E.	38.4	88	7 33	-8	—	—	21.3	24.1
	N.	38.4	88	7 35	-6	16 27	?SR ₁	20.7	24.2
Tacubaya	E.	39.3	133	8 36	+47	14 49	+53	23.0	25.1
	N.	39.3	133	8 37	+48	14 53	+57	23.0	26.9
Dyce	E.	64.0	29	—	—	—	—	30.4	37.2
	N.	64.0	29	—	—	i 19 39	+26	31.2	35.4
Edinburgh		64.7	30	—	—	—	—	29.3	40.9
Eskdalemuir		65.2	30	—	—	i 19 29	+2	28.6	32.6
Oxford		68.8	32	—	—	—	—	36.1	44.1
Kew		69.4	32	—	—	—	—	—	43.3
De Bilt		70.5	28	—	—	20 37	+5	29.3	37.1
Hamburg		70.5	25	e 11 20	0	i 20 36	+4	e 34.3	37.3
Uccle		71.3	29	e 11 20	-5	e 20 44	+2	e 30.3	35.2
Paris		72.5	31	—	—	—	—	e 34.3	39.3
Strasbourg		74.4	28	e 11 50	+5	e 21 30	+11	e 36.3	45.0
Coimbra	E.	75.8	43	20 15	?S	(20 15)	-80	33.9	42.9
	N.	75.8	43	—	—	i 21 42	+7	34.6	41.8
Vienna		77.1	23	—	—	—	—	e 40.3	57.3
Moncalieri		77.6	30	e 12 28	+23	21 57	+1	34.0	43.7
Rio Tinto		78.5	43	24 20	?	—	—	42.3	—
Barcelona		78.8	35	—	—	e 21 34	-36	e 33.2	43.3
Tortosa		78.8	38	—	—	—	—	e 32.3	51.2
Florence		79.8	28	33 48	?L	—	—	(33.8)	39.3
San Fernando		79.8	44	—	—	—	—	42.5	44.3
Rocca di Papa		82.1	28	e 12 33	+2	e 22 48	+1	e 41.8	52.1
Algiers		83.3	37	i 12 40	+2	23 14	+14	39.3	46.3
La Paz		85.8	124	12 53	+1	i 23 33	+5	41.6	52.1
Helwan		97.9	17	24 20	?S	(26 20)	+45	—	—
Riverview		109.4	240	—	—	—	—	e 42.3	55.2
Melbourne		115.8	240	—	—	—	—	e 52.3	67.3

Additional records and notes: Toronto gives $iL = +19.0m.$ and $+22.3m.$
Dyce gives its records at 6h. Eskdalemuir $iE = +19m.31s.$ De Bilt
MN = +37.7m. Hamburg MN = +38.3m. Uccle PR₁ = +25m.20s.
(?SR₁), MN = 40.8m. Strasbourg MN = +41.6m. Moncalieri MN =
+43.2m. San Fernando MN = +48.3m. Riverview MN = +54.6m.

Mar. 29d. Records also at 1h. and 6h. (La Paz), 7h. (Riverview and Moncalieri), 9h. and 11h. (Zurich), 15h. (Colombo), 18h. (La Paz), 21h. (Algiers), 22h. (near Tokyo).

Mar. 30d. 1h. 4m. 15s. Epicentre $46^{\circ}0'N$. $9^{\circ}0'E$. (as on 1918 Sept. 26d.).

$A = +.686$, $B = +.109$, $C = +.719$.

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Coire		1.0	i 0 25	+10	i 0 47	+19	—	—
Zurich	E.	1.4	e 0 21	0	i 0 39	0	—	0.7
	N.	1.4	e 0 20	- 1	i 0 40	+ 1	—	0.7
	V.	1.4	e 0 22	+ 1	i 0 41	+ 2	—	0.7
Neuchatel		1.8	0 12	-16	6 21	-30	—	—
Strasbourg		2.7	0 38	- 4	1 35	+21	(1.6)	—
Paris		5.2	e 1 52	+32	(2 15)	- 7	2.2	—
De Bilt		6.6	—	—	—	—	e 3.6	—

Mar. 30d. Records also at 8h. (Riverview and La Paz), 10h. (near Athens; and Rocca di Papa), 11h. (near Lemberg), 12h. (Taihoku), 16h. (Riverview, Simla, and La Paz), 19h. (San Fernando and Riverview), 23h. (Kodaikanal).

Mar. 31d. Records at 0h. (near Taihoku), 2h. (San Fernando and near Rocca di Papa), 4h. (La Paz), 8h. (Kodaikanal), 12h. (Florence), 15h. (Stonyhurst (2) and La Paz), 16h. (Helwan), 17h. (La Paz), 18h. (Helwan), 23h. (Riverview and near Vieques).

The International Seismological Summary for 1920 April, May, June.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

In the present number (for April, May, June, 1920) there are 48 cases where a former epicentre is adopted as satisfying the observations ; eight others in which a new epicentre is adopted, but one lying close to a former determination (say within $1^{\circ}0'$) : and 19 cases where a definitely new epicentre seems to be required. It may be of interest to give for comparison some counts for the whole series of epicentres determined in the years 1913-1920 June. There are 359 recorded once only, 131 recorded twice, and others according to the following table :

No. of times.	Cases.	No. of times.	Cases.	No. of times.	Cases.
1	359	5	13	9	3
2	131	6	16	11	1
3	60	7	6	14	2
4	30	8	2	16	1

These counts are only approximate, for in many cases it has been difficult to decide whether a subsequent shock has come from the same epicentre or one slightly differing in locality. When the difference between two independent determinations is only a fraction of one degree as in the pair

1914 March 6 $53^{\circ}0'N. 158^{\circ}0'E.$

1914 March 27 $53^{\circ}1'N. 158^{\circ}4'E.$

the epicentres have (in the light of accumulated experience) been regarded as from the same focus : but sometimes there seems to be good reason for assuming a definite departure, as on 1920 May 20, when $11^{\circ}7'S. 166^{\circ}3'E.$ has been used, although on five previous dates, viz., 1914 June 26, 1918 March 20, April 15, and Dec. 14, and 1919 Nov. 20, the epicentre $13^{\circ}0'S. 166^{\circ}8'E.$ has been used. It should further be remarked that repetitions from the same epicentre on the same calendar day (Greenwich) have not been credited as separate shocks, though when they fall on a new calendar date (even within 24 hours) they have been so credited. Briefly the figures are only rough.

They suffice to shew, however, that it is about an even chance whether any new shock will turn out to have come from an epicentre previously utilized or not. For the epicentre used 16 times provides 15 cases of repetition and one of use for the first time. Adding up corresponding numbers in all the cases we find that there are 624 cases of use for the first time and 598 of repetition. But the figures (given in the opening paragraph) for April, May, June, 1920, shew a considerable excess of old epicentres over new. We may infer that the number of unrepeatd epicentres may in the future not increase indefinitely, but may reach a limit. It does not seem impossible that something like a catalogue of the more important epicentres may be attempted after a few more years of registration.

In this connection it may further be of interest to give a list of the 19 epicentres new in this number of the summary, with the nearest old epicentre in each case.

Date.	New.	Position.	Nearest	Old.	Date.	Distance
			Position.			Apart.
1920 April 16	57°3'N. 165°0'W.	55°0'N. 169°0'W.	1916 April 18	3·2		
1920 June 18	33°0'N. 121°5'W.	32°0'N. 119°0'W.	1915 Nov. 21	2·3		
1920 April 19	18°4'N. 94°3'W.	19°0'N. 96°0'W.	1914 Mar. 30	1·8		
1920 May 20	65°0'S. 39°0'W.	(See below)				
1920 June 26	18°5'S. 10°0'W.	13°0'S. 10°0'W.	1917 Aug. 21	5·5		
1920 May 13	49°8'N. 12°0'E.	47°0'N. 10°0'E.	1917 Sept. 6	3·2		
1920 June 20	43°5'N. 17°0'E.	43°0'N. 15°0'E.	1920 June 21	1·4		
1920 May 19	34°0'N. 21°0'E.	33°0'N. 22°0'E.	1918 Oct. 14	1·3		
1920 May 27	19°0'N. 109°0'E.	15°5'N. 109°0'E.	1919 Nov. 16	3·5		
1920 May 19	6°5'S. 126°0'E.	8°0'S. 127°5'E.	1920 Mar. 3	2·2		
1920 May 10	5°5'S. 130°0'E.	4°5'S. 131°0'E.	1919 Nov. 18	1·4		
1920 April 15	33°0'N. 139°0'E.	33°2'N. 138°0'E.	1919 May 31	0·8		
1920 May 22	23°0'S. 142°0'E.	23°3'S. 150°6'E.	1918 June 6	7·9		
1920 April 2	10°2'S. 143°4'E.	7°0'S. 145°0'E.	1918 Sept. 30	3·6		
1920 June 9	54°8'N. 143°7'E.	51°5'N. 147°0'E.	1915 Feb. 25	3·8		
1920 April 11	48°3'N. 152°0'E.	48°0'N. 148°0'E.	1919 Sept. 12	2·7		
1920 May 20	11°7'S. 166°3'E.	13°0'S. 166°8'E.	1919 Nov. 20	1·4		
1920 June 12	23°8'S. 172°5'E.	24°0'S. 171°6'E.	1918 Sept. 30	0·8		
1920 May 9	51°7'S. 173°8'E.	48°2'S. 165°8'E.	1918 Nov. 3	6·2		

It will be seen that about half of these are 3° or more from any other epicentre—a quantity about which there ought to be no mistake. One of the new epicentres is in the Antarctic. The only epicentres used up to the present south of 50°S. lat. are as follow :

73°0'S. 120°0'W. on 1917 Mar. 22
 51°5'S. 75°5'W. „ 1919 Aug. 11
 65°0'S. 39°0'W. „ 1920 May 20
 65°0'S. 0°0'E. „ 1917 July 15
 77°0'S. 110°0'E. „ 1918 Aug. 17
 53°8'S. 148°0'E. „ 1920 Mar. 11
 51°7'S. 173°8'E. „ 1920 May 9

It will be seen that these dates are all subsequent to 1917 Jan. 1, when a more extensive reduction was begun. Probably other cases could be recovered in the years 1913-1916 by a more searching scrutiny: but large earthquakes south of 50°S. are apparently not common.

Attention may be drawn to the following cases of deep focus in the present number:

Date.	Epicentre.	Depth.
April 6d. 19h.	5°0'S. 155°0'E.	+ 0·050
May 6d. 9h.	44°0'N. 131°0'E.	+ 0·070
May 10d. 18h.	5°5'S. 130°0'E.	+ 0·060
May 27d. 5h.	5°0'N. 110°0'E.	+ 0·050

H. H. TURNER.

University Observatory, Oxford.
1924 Aug. 26.

1920 APRIL, MAY, & JUNE.

April 1d. 18h. 26m. 38s. Epicentre $46^{\circ}0'N$. $9^{\circ}0'E$. (as on 1920 Mar. 30d.).

$$A = +.686, B = +.109, C = +.719.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Coire		1.0	22	—	—	i 0 47	+19	—	—
Zurich	E.	1.4	348	e 0 21	0	0 39	0	—	0.7
Neuchatel		1.8	305	0 14	-14	0 23	-28	—	—
Strasbourg		2.7	342	e 0 40	- 2	e 1 29	?L (e 1.5)	—	—

Zurich gives also $iP = +23s.$, $iSN = +40s.$, $iSV = +41s.$, $T_0 = 18h.26m.37.5s.$

April 1d. Readings also at 0h. (La Paz), 1h. (Helwan and Cape Town), 2h. (Helwan), 4h. (2), 5h., and 6h. (Stonyhurst), 7h. (Stonyhurst and Helwan), 8h. (Stonyhurst), 9h., 12h., and 14h. (La Paz), 15h. (Stonyhurst), 18h. (near Zurich, repetition of the above), 21h. (La Paz), 23h. (near Tacubaya).

April 2d. 1h. 5m. 0s. Epicentre $10^{\circ}2'S$. $143^{\circ}4'E$.

$$A = -.790, B = +.587, C = -.177; \quad D = +.596, E = +.803; \\ G = +.142, H = -.106, K = -.984.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview		24.7	164	e 5 34	- 1	e 9 55	- 2	e 12.5	18.3
Sydney		24.7	164	7 0	+85	—	—	11.0	14.0
Melbourne		27.6	177	—	—	11 48	+56	14.8	19.8
Manila		33.3	320	e 6 50	- 9	—	—	—	—
Perth		33.4	225	13 45	?S	(13 45)	+75	16.8	—
Batavia		36.4	273	7 25	0	9 18	?PR ₁	—	12.1
Apia		44.0	100	—	—	—	—	—	21.0
Osaka		45.5	351	7 25	-72	—	—	—	16.4
Honolulu		65.5	61	e 17 12	?	e 23 6	?SR ₁	e 30.0	33.4
Kodaikanal		68.7	285	52 42	?L	—	—	(52.7)	—
Mauritius	E.	82.3	250	34 18	?L	—	—	(34.3)	43.4
Victoria		99.8	42	38 31	?L	—	—	(38.5)	49.3
Helwan		114.1	297	30 0	?S	(30 0)	+117	(38.0)	—
Hamburg		122.9	329	e 20 0	?PR ₁	—	—	e 57.0	—
De Bilt		126.2	329	—	—	e 36 44	?SR ₁	e 56.0	64.2
Rocca di Papa		126.6	315	e 18 18	[-52]	e 26 30	?	70.1	76.1
Strasbourg		126.8	322	—	—	—	—	e 58.0	—
Uccle		127.3	328	—	—	e 37 0	?SR ₁	e 57.0	—
Edinburgh		127.4	337	—	—	—	—	62.0	—
Moncalieri		128.5	320	e 23 18	?PR ₁	37 44	?SR ₁	62.6	—
Stonyhurst		128.6	334	36 0	?	56 0	?	60.0	—
Paris		129.4	327	—	—	e 30 42	+45	62.0	—
Toronto		130.2	39	—	—	—	—	65.0	72.7
Tortosa		135.2	320	—	—	—	—	e 63.0	78.2
La Paz		138.9	130	18 24	[-74]	—	—	68.5	69.6
San Fernando	E.	142.0	319	67 0	?L	—	—	(67.0)	116.0
	N.	142.0	319	57 0	?L	—	—	(57.0)	127.0

Additional readings and notes: Riverview gives $MN = +17.3m.$, $MZ = +16.9m.$, $Osaka$ $MN = +17.4m.$, $Honolulu$ $eL = +26.7m.$, $Mauritius$ $PN = +35m.24s.$, $De Bilt$ $MN = +72.0m.$, $Strasbourg$ $L = +63.0m.$, $Toronto$ $eL = +66.5m.$, $+70.3m.$, and $+82.1m.$ The PN for San Fernando has been increased by 2h. to be consistent with PE and MN .

April 2d. 15h. 10m. 0s. Epicentre 7°0'N. 137°0'E. (as on 1918 June 29d.).

$$A = -.726, B = +.677, C = +.122; \quad D = +.682, E = +.731; \\ G = -.089, H = +.083, K = -.993.$$

It is impossible to satisfy the observations as they stand. The only two direct determinations of T_0 from P and S (Manila 15h.12m.15s. and Riverview 15h.11m.15s.) are discordant, and either would assign values of Δ to these and the Japanese stations too small for their distance apart, unless we assume a very deep focus.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	17.5	297	e 4 53	+42	7 0	-29	7.8	7.9
Osaka	27.7	357	5 2	-63	—	—	9.0	9.6
Tokyo	28.8	4	7 34	+78	—	—	10.6	14.2
Riverview	43.0	163	e 8 59	+41	e 15 4	+16	e 20.7	24.1
Sydney	43.0	163	12 30	?	16 0	+72	19.8	21.0
Melbourne	45.4	171	—	—	15 18	-2	—	26.3
Simla	60.7	302	30 42	?L	—	—	(30.7)	—
Honolulu	64.2	70	19 0	?S	(19 0)	-15	35.4	41.4
Victoria	91.2	40	27 38	?	—	—	—	46.8
Helwan	99.9	302	24 0	?S	(24 0)	-115	—	—
De Bilt	108.1	331	—	—	—	—	e 50.0	53.9
Strasbourg	108.9	326	—	—	—	—	—	66.3
Edinburgh	109.1	337	—	—	—	—	50.0	44.0
Uccle	109.3	330	—	—	e 36 18	?	e 51.0	53.0
Kew	111.0	332	—	—	—	—	—	67.0
Moncalieri	111.0	324	e 21 31	?PR ₁	28 57	+80	35.0	—
Oxford	111.2	332	—	—	34 6	?SR ₁	—	59.6
Paris	111.4	329	—	—	—	—	57.0	68.0
Algiers	118.6	319	—	—	—	—	65.0	—
San Fernando	124.5	324	75 0	?L	—	—	(75.0)	80.0
La Paz	153.6	113	20 0	[-1]	—	—	75.0	—

Additional readings: Manila gives MN = +8.5m. Osaka MN = +10.9m.
Riverview MN = +25.5m. De Bilt MN = +54.4m.

April 2d. 15h. 34m. 20s. Epicentre 37°5'N. 27°5'E. (as on 1918 Nov. 13d.).

$$A = +.704, B = +.366, C = +.609; \quad D = +.462, E = -.887; \\ G = +.540, H = +.281, K = -.793.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3.0	278	0 44	-3	1 21	-2	1.6	2.1
Pompeii	10.5	294	6 40	?L	—	—	(6.7)	—
Lemberg	12.6	350	e 0 40	?	—	—	e 8.8	9.9
Vienna	13.4	326	14 17	+59	6 18	+25	8.0	9.5
Strasbourg	18.1	314	e 4 22	+4	e 7 46	+4	e 9.7	11.1
Algiers	19.4	275	4 26	-8	—	—	—	—
Hamburg	20.1	328	e 4 42	0	e 8 32	+7	e 11.7	15.0
Uccle	21.1	316	—	—	e 8 49	+3	—	—
Paris	21.3	310	e 4 54	-3	e 12 34	?L	(e 12.6)	—
De Bilt	E. 21.4	320	e 6 52	?	e 8 58	+5	11.7	14.6
N. 21.4	320	—	—	—	e 9 4	+11	—	12.5
Oxford	24.7	314	9 46	?S	(9 46)	-11	—	—
San Fernando	26.8	278	11 40	?S	(11 40)	+63	—	50.7
Eskdalemuir	27.3	321	—	—	—	—	14.7	—
Edinburgh	27.5	322	e 9 10	?	e 15 52	?L	(e 15.9)	—
La Paz	104.3	260	55 44	?L	—	—	(55.7)	—

Additional readings and notes: Athens gives its readings 3min. early, MN = +2.0m. Hamburg MNZ = +14.5m.

April 2d. Readings also at 0h. (Christchurch), 7h. (Victoria and near Oaxaca, Tacubaya, and Athens), 13h. (Paris and La Paz), 14h. (La Paz, Taihoku, Tortosa, and Manila), 16h. (Hamburg), 17h. (Stonyhurst), 22h. (near Athens).

April 3d. Readings at 0h. (San Fernando), 3h. (near Tokyo and Mizusawa), 10h. (near Taihoku), 21h. (Helwan).

April 4d. Readings at 0h. (Capetown), 2h. (La Paz and San Fernando), 7h. (La Paz), 9h. (near Tacubaya), 11h. (near Osaka and Kobe), 15h. (Helwan), 16h. (near Taihoku), 17h. (Batavia), 18h. (Helwan and La Paz), 20h. (near Tokyo).

April 5d. 12h. 18m. 26s. Epicentre $41^{\circ}0'N$. $13^{\circ}5'E$.

$$A = +.734, B = +.176, C = +.656.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Pompeii	0.9	110	0 15	+ 1	0 27	+ 2	—	0.7
Rocca di Papa	1.0	321	i 0 16	+ 1	0 30	+ 2	—	0.7
Florence	3.2	329	1 29	?S	(1 29)	+ 1	—	2.0
Padova	4.5	345	1 35	+25	2 30	?L	(2.5)	—
Moncalieri	5.8	316	e 2 16	+46	3 29	+50	5.1	—
Paris	11.0	319	—	—	—	—	e 6.6	—
De Bilt	12.5	336	—	—	—	—	e 5.3	—
Hamburg	12.8	351	e 5 34	?S	(e 5 34)	- 5	—	7.6

No additional readings.

April 5d. 15h. 52m. 20s. Epicentre $4^{\circ}0'S$. $138^{\circ}0'E$. (as on 1915 Aug. 3d.).

$$A = -.741, B = +.667, C = -.070; D = +.669, E = +.743; \\ G = +.052, H = -.047, K = -.998.$$

This is only a rough approximation to the time and place of the shock. The evidence is slight and conflicting.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	25.1	317	e 6 34	+55	—	—	—	—
Adelaide	30.9	179	—	—	12 25	+35	14.1	20.7
Batavia	31.3	263	e 6 23	-18	e 8 11	?PR ₁	—	—
Riverview	32.2	159	e 7 2	+12	(e 12 34)	+23	e 12.6	16.2
Melbourne	34.4	170	—	—	—	—	18.5	19.3
Perth	34.8	214	12 35	?S	(12 35)	-17	20.0	—
Zi-ka-wei	38.6	337	e 7 46	+ 3	e 13 31	-15	—	—
Helwan	106.3	300	28 40	?S	(37 40)	?SR ₁	—	—
Hamburg	114.9	329	—	—	—	—	53.7	—
De Bilt	118.2	328	e 20 4	?PR ₁	e 30 11	+95	e 60.7	62.0
N.	118.2	328	—	—	—	—	e 59.7	64.5
Strasbourg	118.7	322	—	—	—	—	e 62.7	—
Uccle	119.3	327	—	—	—	—	54.7	—
Edinburgh	119.5	336	—	—	—	—	61.7	—
Eskdalemuir	119.9	336	—	—	29 40	+52	—	—
Stonyhurst	120.7	334	7 40	?	15 10	?P	22.2	—
Paris	121.5	327	e 20 44	?PR ₁	—	—	63.7	—
La Paz	147.0	129	19 20	[-31]	—	—	39.9	43.0

Additional readings: Riverview records eS as eL and gives eS = +10m.43s., MZ = +21.7m. Helwan gives its two readings as PN and PE.

April 5d. Readings also at 0h. (San Fernando), 5h. (near Oaxaca), 10h. (Cape Town), 11h. (La Paz), 14h. (Helwan), 15h. (La Paz), 16h. (Stonyhurst, Batavia, and near Rocca di Papa, Pompeii), 18h. (Manila), 20h. (near Tacubaya), 21h. and 23h. (La Paz).

April 6d. 16h. 43m. 20s. Epicentre $15^{\circ}6'N$. $97^{\circ}8'W$.

$$A = -.131, B = -.954, C = +.269; D = -.991, E = +.136; \\ G = -.036, H = -.266, K = -.963.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Oaxaca	1.7	35	0 41	+15	(0 41)	- 7	0.9	1.0
Tacubaya	4.0	341	1 24	+22	—	—	3.3	3.5
Mazatlan	11.1	315	2 45	- 1	—	—	7.0	7.3
Tucson	20.4	327	11 18	?L	—	—	11.5	11.9
Chicago	27.6	17	6 7	+ 3	11 3	+11	17.0	—
Georgetown	29.5	34	e 6 17	- 6	11 50	+24	—	—
Berkeley	31.0	321	—	—	—	—	e 15.8	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Toronto	32.1	26	—	—	19 52	?	26.6	—
Ottawa	35.1	28	i 7 5	- 9	12 40	-17	—	—
Victoria	38.9	333	13 56	?S	(13 56)	+ 5	20.3	24.3
La Paz	43.6	137	e 8 23	0	15 58	+62	23.7	27.3
Stonyhurst	80.6	38	24 52	?	—	—	—	—
San Fernando	82.1	53	43 40	?L	—	—	(43.7)	44.7
Paris	84.9	40	—	—	e 23 37	+19	39.7	—
De Bilt	E. 85.4	37	—	—	e 23 26	+ 3	e 42.7	46.6
	N. 85.4	37	—	—	—	—	e 44.7	46.5
Uccle	85.4	38	e 12 54	+ 4	e 23 13	-10	e 40.7	—
Strasbourg	88.2	39	e 13 10	+ 4	e 24 4	+10	e 46.7	—
Algiers	89.1	51	e 24 5	?S	(e 24 5)	+ 1	50.7	—
Helwan	113.1	47	68 40	?L	—	—	(68.7)	—

Additional readings : Oaxaca readings increased by 3min. Ottawa gives $T_0 = 16h.43m.22s.$ San Fernando MN = +47.7m. Helwan P = +69m.40s.

April 6d. 19h. 2m. 25s. Epicentre $5^\circ.0S. 155^\circ.0E.$ (as on 1913 July 22d.).

A = - .903, B = + .421, C = - .087 ; D = + .423, E = + .906 ;

G = + .079, H = - .037, K = - .996.

This earthquake does not seem to afford a good determination without the assumption of a deep focus. Although there is no anti-centric support to this hypothesis, it might be noticed that on 1918 Dec. 25d. an earthquake occurred in this neighbourhood which required a very great depth, 0.070, to bring its readings into line. In the present case 0.050 is sufficient.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	s.	m.	m.
Riverview	-3.1	29.0	186	e 4 41	-66	e 10 15	- 5	e 13.1	15.3
Sydney	-3.1	29.0	186	5 53	+ 6	10 5	-15	13.2	14.3
Adelaide	-3.5	33.6	205	—	—	11 5	-31	14.1	17.6
Melbourne	-3.5	34.1	192	5 17	-17	11 41	- 3	15.7	17.5
Manila	-3.9	39.0	301	e 6 56	-18	12 33	-25	16.2	18.2
Mizusawa	-4.4	45.5	347	7 58	- 6	—	—	—	—
Perth	-4.5	45.9	229	16 23	?	14 46	+19	26.2	—
Batavia	-4.6	48.0	266	8 25	+ 4	15 10	+16	e 22.6	—
Zi-ka-wei	-4.6	48.3	321	e 8 49	+25	e 14 59	+ 1	—	—
Honolulu	-5.0	53.0	58	9 11	+17	i 16 11	-17	24.5	36.8
Colombo	-6.0	75.9	279	20 35	?S	(20 35)	+10	—	43.6
Kodaikanal	-6.1	78.7	282	46 5	?L	—	—	(46.1)	—
Berkeley	-6.4	87.3	50	—	—	e 22 35?	+ 1	—	—
Victoria	-6.5	88.3	41	—	—	16 1	?PR ₁	21.4	29.3
Mauritius	-6.6	94.9	250	23 35	?S	(23 35)	-20	—	53.9
Chicago	—	113.6	47	28 50	?S	(28 50)	+51	53.1	—
Toronto	—	118.7	41	—	—	—	—	43.8	—
Cape Town	—	123.5	224	32 30	?SR ₁	—	—	—	71.3
Hamburg	—	123.7	335	e 20 35	?PR ₁	—	—	e 58.6	—
De Bilt	—	126.7	337	e 20 45	?PR ₁	e 30 59	+81	e 56.6	60.3
Stonyhurst	—	127.8	341	38 35	?SR ₁	43 35	?	56.6	62.1
Uccle	—	128.0	337	20 47	?PR ₁	27 23	-144	e 55.6	60.6
Strasbourg	—	128.3	332	20 38	?PR ₁	—	—	e 62.6	—
Rocca di Papa	—	130.2	322	i 19 40	[+22]	21 36	?PR ₁	e 59.6	69.6
Paris	—	130.4	336	e 20 35	?PR ₁	—	—	62.6	—
Moncalieri	—	130.9	330	e 20 59	?PR ₁	34 13	?SR ₁	58.8	—
La Paz	—	132.2	118	19 28	[+ 5]	30 46	?	55.4	58.4
Tortosa	—	137.5	331	e 21 35	?PR ₁	—	—	e 64.6	67.6
Algiers	—	139.1	325	e 21 25	?PR ₁	—	—	76.6	—
Rio Tinto	—	143.5	336	21 35	?PR ₁	—	—	—	27.6

Additional readings and notes : Riverview gives PS = +10m.37s., MN = +14.2m., MZ = +15.9m. Adelaide SR₁ = +12m.50s. Manila MN = +17.8m. Mizusawa PN = +8m.11s. (O-C. = +7s.). Mauritius PE = +22m.47s. Toronto L? = +34.7m. De Bilt e = +39m.57s., MN = +63.6m. Uccle e = +37m.35s. (?SR₁). Rocca di Papa ePN = +18m.47s.

April 6d. Readings also at 0h. (Manila, Algiers, San Fernando, and near Mizusawa), 1h. (La Paz (2)), 12h. (Harvard), 16h. (Stonyhurst (4)), 18h. (Coimbra and near La Paz), 20h. (La Paz, Mizusawa, and Toronto), 21h. (Toronto, Victoria, Riverview, and near Manila), 23h. (Algiers).

April 7d. Readings at 0h. (San Fernando), 11h. (La Paz), 17h. (near Batavia), 19h. (Tokyo), 20h. (San Fernando), 22h. (near La Paz).

April 8d. Readings at 0h. (Manila), 1h. (De Bilt and Paris), 8h. and 10h. (La Paz), 14h. (Riverview (2) and Sydney), 15h. (Helwan), 16h. (La Paz and near Tacubaya), 22h. (Riverview).

April 9d. Readings at 4h. (near Balboa Heights), 5h. (Manila), 6h. (San Fernando), 8h. (near Mizusawa), 11h. (Azores), 14h. (La Paz, near Osaka, Mizusawa (2), and Manila), 15h. (Victoria and Toronto), 16h. (La Paz), 17h. (near Zurich), 19h. (Batavia and Riverview), 21h. (San Fernando).

April 10d. Readings at 2h. (Algiers), 5h. (near Kobe), 7h. (La Paz), 8h. (Helwan and Victoria), 10h. (near Mizusawa), 13h. and 22h. (San Fernando).

1920. April 11d. 23h. 3m. 35s. Epicentre $48^{\circ}3'N$. $152^{\circ}0'E$.

A = -·587, B = +·312, C = +·747; D = +·470, E = +·883;

G = -·659, H = +·351, K = -·665.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ootomari		6·4	258	2 6	+28	—	—	3·4	3·8
Hakodate		10·3	235	e 2 29	— 5	—	—	—	—
Mizusawa	E.	12·1	224	3 0	0	5 14	- 7	—	—
Tokyo		15·6	220	4 5	+18	4 23	?	6·8	6·9
Nagoya		17·2	226	4 8	+ 1	—	—	—	—
Osaka		18·4	228	4 26	+ 4	(7 54)	+ 5	7·9	8·7
Kobe		18·5	229	4 25	+ 2	(7 47)	- 4	7·8	8·8
Nagasaki		22·8	235	e 5 13	- 2	(e 9 3)	-18	e 9·0	—
Zi-ka-wei		28·8	245	e 7 5	+49	10 53	-20	—	—
Taihoku		33·4	238	—	—	e 12 28	- 2	—	—
Manila		42·3	229	e 8 22	+ 9	12 20	?	14·0	15·1
Honolulu		47·9	106	15 37	?S	(15 37)	-16	e 24·8	25·6
Victoria		53·2	56	10 36	+69	(17 0)	+ 1	17·0	23·9
Batavia		67·3	231	e 11 6	+ 6	e 19 17	-37	e 24·4	—
Hamburg		73·2	339	e 11 37	0	e 21 3	- 1	e 34·4	36·4
Eskdalemuir		74·3	348	—	—	i 21 13	- 5	37·4	—
Stonyhurst		75·6	346	21 25	?S	(21 25)	- 8	31·0	—
Chicago		75·7	42	e 14 40	?PR ₁	21 13	-21	29·9	—
De Bilt	E.	75·7	340	11 54	+ 1	21 35	+ 1	32·4	41·8
	N.	75·7	340	—	—	—	—	36·4	41·6
Budapest		75·8	330	11 55	+ 1	—	—	—	—
Vienna		76·1	331	i 11 56	0	—	—	—	22·2
Uccle		77·1	340	e 12 0	- 2	21 57	+ 7	e 34·4	—
Kew		77·4	345	—	—	—	—	—	50·4
Ottawa		77·4	32	—	—	e 21 33	-20	—	—
Toronto		77·5	37	—	—	—	—	45·3	—
Strasbourg		78·3	337	12 7	- 2	—	—	e 37·4	—
Zurich	E.	79·2	336	e 12 13	- 1	i 12 17	?	—	—
	N.	79·2	336	e 12 12	- 2	i 12 16	?	—	12·4
	Z.	79·2	336	e 12 11	- 3	i 12 15	?	—	—
Paris		79·3	340	e 12 16	+ 1	e 22 14	- 1	41·4	—
Besancon		80·0	339	12 20	+ 1	22 27	+ 4	37·4	—
Florence		81·6	332	12 0	-28	22 26	-16	34·4	51·4
Harvard		81·6	30	—	—	22 30	-12	—	—
Moncalieri		81·6	336	12 34	+ 6	22 36	- 6	33·5	49·7
Riverview		82·2	181	e 12 56	+25	e 22 26	-22	e 33·9	38·5
Washington		82·5	38	e 12 42	+ 9	22 28	-24	37·9	—
Georgetown		82·5	38	e 12 25	- 8	22 42	-10	48·5	—
Rocca di Papa		83·0	330	e 12 34	- 2	—	—	—	12·8
Helwan		85·6	312	12 25	-26	(22 25)	-61	—	—
Tortosa		87·4	340	12 52	- 9	(e 22 25)	-80	e 22·4	25·1
San Fernando		93·0	345	41 25	?L	—	—	(41·4)	57·2
La Paz		134·4	59	i 19 35	[+ 6]	—	—	67·4	—

For Notes see next page.

NOTES TO APRIL 11d. 23h. 3m. 35s.

Additional readings and notes: Mizusawa gives MN = +5m.9s. Osaka MN = +8.1m. Kobe MN = +8.9m. Manila MN = +16.6m., T_0 = 23h.6m.59s. Honolulu records S as P and gives S = +19m.25s. (?SR₁). Eskdalemuir records S as i and gives S? = +26m.42s. Stonyhurst S = +25m.43s. De Bilt T_0 = 23h.3m.46s. Epicentre 45°·5'N, 153°·0'E. Vienna i = +12m.6s. The shock seems to have been mistaken for a local one at Vienna and Zurich. Uccle SR₁ = +27m.1s., T_0 = 23h.3m.36s. Toronto L = +27.1m. and 48.5m. Florence MN = +50.4m. and +52.9m. Harvard gives ?N at 5 times, including that read as S. The other four are +19m.41s., +21m.55s., +22m.30s., and +22m.35s. Riverview MN = +44.8m., T_0 = 23h.5m.0s. Helwan gives its readings as PN and PE. La Paz gives L = +58.4m. and +85.9m.

April 11d. Readings also at 3h. (Helwan), 6h. (near Rocca di Papa), 9h. (Helwan), 13h. (Zi-ka-wei and near Taihoku), 17h. (2) and 18h. (2) (Stonyhurst), 19h. (Apia, Riverview, and Stonyhurst (2)), 20h. (La Paz, Stonyhurst, and Colombo), 21h. (Helwan, Stonyhurst, and San Fernando), 22h. (Stonyhurst and Manila), 23h. (Stonyhurst).

April 12d. Readings at 0h. (Berkeley and near Florence), 2h. (Stonyhurst (3)), 3h. (La Paz), 6h. (La Paz), 8h. (Helwan), 14h. (Helwan, Mizusawa, and near Osaka and Kobe), 17h. (Helwan, near Tokyo and Mizusawa, and near Vieques), 18h. (Helwan), 19h. (Rio Tinto), 20h. (Port au Prince).

April 13d. Readings at 0h. (Taihoku and La Paz), 2h. (Colombo), 3h. (La Paz), 4h. (Point Loma), 5h. (near Osaka and Kobe), 10h. (Nagasaki), 14h. (Chicago and near Mazatlan), 17h. (Harvard and Chicago).

April 14d. Readings at 0h. (Algiers), 3h. (near Athens), 12h. (La Paz), 13h. (Rocca di Papa), 18h. (Osaka), 20h. (Rio Tinto), 21h. (San Fernando), 23h. (La Paz).

April 15d. 12h. 13m. 30s. Epicentre 33°·0'N. 139°·0'E.

$$A = -.633, B = +.550, C = +.545; \quad D = +.656, E = +.755; \\ G = -.411, H = +.357, K = -.839.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	2.5	13	0 57	+18	—	—	1.7	1.8
Osaka	3.4	299	0 57	+ 4	—	—	1.7	2.7
Kobe	3.6	298	0 54	- 2	—	—	1.6	1.7
Mizusawa	6.3	15	1 34	- 2	2 48	- 4	—	—
Zi-ka-wei	15.0	268	e 3 4	-35	—	—	—	—
Manila	24.7	226	e 6 30	+55	—	—	—	—
Helwan	87.1	304	21 30	?S	(21 30)	-132	—	—
La Paz	150.5	63	19 21	[-35]	—	—	—	—

Additional readings: Osaka gives MN = +2.9s. Helwan PN = +7m.30s.

April 15d. Readings also at 2h. (Helwan), 10h. (La Paz), 12h. (La Paz), 19h. (San Fernando), 20h. (near Mizusawa).

April 16d. 22h. 35m. 15s. Epicentre $57^{\circ}3'N$. $165^{\circ}0'W$.

A = -·522, B = -·140, C = +·842; D = -·259, E = +·966;
G = -·813, H = -·218, K = -·540.

Very uncertain.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria	26·2	92	(5 51)	+ 1	—	—	5·8	15·2
Berkeley	33·9	108	—	—	e 13 45	+ 66	—	—
Honolulu	36·3	169	8 45	?PR ₁	—	—	—	20·0
Chicago	49·6	75	6 25?	-159	11 30	?PR ₁	17·6	—
Toronto	52·3	67	—	—	—	—	e 28·0	29·0
Ottawa	52·9	61	—	—	—	—	24·8	—
Ithaca	54·7	65	—	—	—	—	29·8	—
Zi-ka-wei	55·5	276	e 1 49	?	—	—	—	—
Georgetown	57·0	69	e 11 14	+82	—	—	35·0	—
Washington	57·0	69	—	—	—	—	e 28·2	—
Harvard	57·3	61	—	—	13 48	?PR ₁	29·0	35·5
Eskdalemuir	66·4	11	i 12 54	?PR ₁	—	—	32·8	—
Hamburg	69·0	3	e 30 45	?	—	—	38·8	42·8
De Bilt	E. 70·3	6	e 11 18	- 1	e 20 28	- 2	e 33·8	42·9
	N. 70·3	6	—	—	—	—	e 30·8	42·5
Kew	70·5	10	—	—	—	—	—	51·8
Uccle	71·6	8	—	—	(20 45)	0	e 30·8	—
Strasbourg	74·0	4	—	—	—	—	e 41·8	—
Simla	77·4	311	e 34 21	?L	—	—	(e 34·4)	—
Moncalieri	77·5	5	e 16 5	?PR ₁	29 23	?SR ₁	43·5	—
Rocca di Papa	81·0	1	i 5 58	?	16 25	?PR ₁	e 47·2	53·2
Rio Tinto	83·2	17	30 45	?SR ₁	—	—	—	63·8
San Fernando	84·6	17	15 45	?PR ₁	—	—	(48·8)	58·8
Helwan	91·8	347	18 45	?PR ₁	(23 45)	-48	—	—

Additional readings and notes: Chicago gives L = +17·7m. All these readings are assumed to be 10min. early. Toronto L? = +12·8m., L = +22·0m. Ottawa e?E = +12m.15s., e?N = +13m.33s. Georgetown eE and N = +11m.14s. Washington L = +34·8m. Harvard eE = +15m.39s., LN = +29·6m., MN = +35·2m., T₀ = 22h.27m.42s. Uccle reads S as SR₁ and gives eS = +14m.15s.

April 16d. Readings also at 6h. (Taihoku), 16h. (La Paz), 18h. (Taihoku).

April 17d. Readings at 0h. (San Fernando), 4h. (Manila), 5h. (Batavia), 10h. (near Mizusawa), 17h. (Helwan), 21h. (San Fernando).

April 18d. 21h. 1m. 45s. Epicentre $57^{\circ}3'N$. $165^{\circ}0'W$. (as on April 16d. 22h.).

A = -·522, B = -·140, C = +·842; D = -·259, E = +·966;
G = -·813, H = -·218, K = -·540.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Sitka	E. 15·9	78	e 6 54	?S	(e 6 54)	+ 1	7·8	9·0
Victoria	26·2	92	—	—	—	—	13·1	14·6
Chicago	49·6	75	25 5	?L	26 0	?	26·4	—
Ann Arbor	51·2	70	—	—	—	—	27·1	—
Toronto	52·3	67	—	—	—	—	24·6	—
Ottawa	52·9	61	—	—	—	—	e 27·8	—
Ithaca	54·7	65	—	—	—	—	e 28·6	—
Northfield	55·2	60	e 29 5	?L	—	—	e 32·2	—
Washington	57·0	69	29 53	?L	—	—	33·2	—
Georgetown	57·0	69	—	—	30 4	?L	31·4	—
Cheltenham	57·3	69	29 26	?L	31 43	?	—	—
Harvard	N. 57·3	61	—	—	—	—	30·3	31·2

Additional readings: Sitka gives ePN = +7m.58s. (?eLN), MN = +10·0m. Ann Arbor MN = +27·3m. Ottawa e = +28m.10s. Georgetown LZ = +33·5m. Cheltenham PN = +29m.57s., PR₁EN = +30m.27s., SR₁N = +33m.17s., SR₁E = +33m.43s.

April 18d. Readings also at 2h. (near Osaka and Kobe), 4h. (near Nagasaki), 5h. (La Paz), 7h. (near Rocca di Papa, Pompeii, and Athens), 8h. (near Batavia), 13h. (near Manila), 14h. (near Algiers), 16h. (La Paz), 20h. (San Fernando and Apia).

1920. April 19d. 21h. 6m. 25s. Epicentre 18° 4N. 94° 3W.

A = -071, B = -946, C = +316; D = -997, E = +075;
G = -024, H = -315, K = -949.

Station and Component.	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Oaxaca	2.7	240	0 1	-41	—	—	0.2	—
Tacubaya	4.9	282	0 39	-37	—	—	1.0	1.3
Mobile	13.4	23	e 4 45	+87	7 1	?L	7.4	7.9
Tucson	E. 20.3	316	4 26	-19	8 4	-25	10.2	11.3
Chicago	24.0	12	i 5 30	-2	9 52	+8	11.8	—
Cheltenham	E. 25.3	33	5 47	+6	—	—	20.3	24.0
	N. 25.3	33	5 47	+6	10 25	+16	17.6	24.2
Georgetown	E. 25.4	32	5 48	+6	10 30	+19	e 12.3	—
	Z. 25.4	32	5 47	+5	—	—	21.8	—
Washington	25.4	32	5 45	+3	10 23	+12	—	—
Ann Arbor	E. 25.5	18	5 59	+16	10 5	-8	12.2	—
	N. 25.5	18	5 35	-8	10 17	+4	12.2	—
	E. 25.5	18	5 59	+16	10 11	-2	—	—
Vieques	E. 27.4	86	6 37	+35	11 35	+47	16.0	17.2
Toronto	28.1	23	6 59	+50	11 11	+10	e 23.6	26.6
Ithaca	28.4	28	6 0	-12	10 57	-9	15.2	—
Lick	30.5	315	e 5 59	-34	—	—	—	—
Harvard	E. 31.0	34	6 33	-5	10 39	-72	e 11.7	—
	N. 31.0	34	e 6 32	-6	(11 48)	-3	e 11.8	—
Ottawa	31.1	26	6 35	-4	11 47	-6	—	—
Berkeley	31.2	316	e 6 4	-36	—	—	e 16.8	—
Northfield	31.5	30	—	—	e 10 35	-85	—	—
Victoria	38.1	330	9 25	?PR ₁	12 52	-47	17.8	23.2
La Paz	43.4	141	8 21	0	14 53	-1	17.8	21.4
Honolulu	59.6	284	e 10 11	+2	i 17 41	-37	26.3	30.1
Coimbra	75.2	51	11 55	+5	21 47	+19	36.4	—
Edinburgh	75.4	37	21 31	?S	(21 31)	+1	37.6	41.1
Eskdalemuir	E. 75.5	37	12 2	+10	21 47	+15	37.6	—
Stonyhurst	76.3	39	21 35	?S	(21 35)	-6	35.6	39.1
Rio Tinto	77.0	54	15 35	?PR ₁	—	—	—	26.6
Oxford	77.5	40	12 36	+32	22 9	+14	—	—
San Fernando	77.7	55	12 8	+3	22 5	+8	—	25.6
Kew	78.1	40	—	—	—	—	—	23.6
Granada	79.5	54	12 29	+13	22 46	+28	—	—
Paris	80.6	41	e 12 25	+2	e 22 23	-7	41.6	—
De Bilt	81.1	38	12 34	+8	22 48	+12	e 39.6	40.5
Uccle	81.1	40	12 26	0	22 46	+10	e 39.6	—
Tortosa	81.6	50	12 35	+7	23 18	+36	35.7	47.9
Barcelona	82.6	48	e 12 35	+1	(22 54)	+1	22.9	—
Besancon	83.3	42	12 42?	+4	—	—	—	—
Hamburg	83.4	36	i 12 37	-1	e 23 13	+12	e 41.6	43.6
Strasbourg	84.0	41	12 39	-3	e 23 14	+6	45.6	—
Algiers	84.7	52	12 46	0	23 11	-5	38.6	51.6
Zurich	84.9	42	12 46	-1	—	—	—	—
Moncalieri	85.2	45	13 6	+17	23 16	-5	31.3	—
Vienna	89.3	39	i 13 4	-8	(e 24 35)	+29	e 24.6	—
Rocca di Papa	89.8	46	e 12 45	-30	(e 24 11)	-1	24.2	26.1
Pompeii	E. 91.5	46	13 35	+11	24 35	+6	—	—
Helwan	108.8	48	19 35	?PR ₁	—	—	—	—
Simla	129.8	9	e 22 5	?PR ₁	—	—	(61.1)	74.8
Manila	132.1	311	e 18 35	[-48]	—	—	—	—
Mauritius	153.7	98	75 5	?L	—	—	(75.1)	—
Batavia	156.0	298	e 19 11	[-52]	—	—	—	22.2

Additional readings: Tacubaya gives all three components for L and M which are substantially the same. Mobile eP = +5m.5s. and +5m.23s. Georgetown SN = +10m.31s., the other N readings being the same as the E or Z. T₀ = 21h.6m.15s. Vieques SN = +11m.45s. Toronto eS = +12m.35s., i = +20m.41s., and +21m.41s., also eL = +33.6m. T₀ = 21h.5m.6s. Harvard PR₁E = +7m.47s., PR₁N = +7m.43s., T₀ = 21h.7m.48s. Berkeley ePN = +6m.5s. Coimbra iE = +12m.23s., iN = +22m.15s. T₀ = 21h.6m.26s. Stonyhurst reads S as P and gives S = +26m.35s. San Fernando MN = +49.6m. T₀ = 21h.6m.34s. Paris i = +12m.50s. and +23m.11s. T₀ = 21h.6m.50s. De Bilt SN = +23m.13s. i = +24m.6s., MN = +41.9m. T₀ = 21h.6m.43s. Uccle i = +12m.53s., SR₁ = +28m.0s. T₀ = 21h.6m.28s. Zurich e = +13m.14s. Vienna iN = +17m.11s., L = +38.6m. Rocca di Papa ePN = +12m.59s., eS = +15m.53s.

April 19d. Readings also at 3h. (near Batavia (3)), 4h. (Zurich), 11h. (La Paz), 14h. (Batavia), 16h. (Stonyhurst), 17h. (Batavia), 20h. (La Paz and Manila).

April 20d. Readings at 2h. (San Fernando), 3h. (near Algiers), 5h. (near Taihoku), 10h. (near Tokyo and near Mizusawa different shocks), 15h. (La Paz and Manila).

April 21d. Readings at 0h. (San Fernando), 4h. (Apia and La Paz), 11h. (Colombo), 12h. (Taihoku), 19h. (Apia), 21h. (Batavia, La Paz, and near Oaxaca and Tacubaya), 22h. (San Fernando).

April 22d. Readings at 0h. (La Paz), 2h. (San Fernando), 4h. (La Paz), 7h. (Cape Town), 8h., 12h., and 15h. (near Mizusawa), 16h. (near Tokyo), 17h. (Cape Town), 19h. (La Paz), 22h. (Nagasaki), 23h. (San Fernando).

April 23d. Readings at 0h. and 2h. (near Mizusawa), 5h. (Nagasaki), 8h. (Uccle and Hamburg), 9h. (Helwan), 10h. (La Paz), 11h. (near Mizusawa), 12h. (La Paz), 14h. (Cape Town), 15h. (near Mizusawa and Tokyo), 18h. (Taihoku and San Fernando), 19h. (Uccle, La Paz, De Bilt, Pompeii, Rocca di Papa, and Strasbourg).

April 24d. Readings at 2h. (La Paz), 3h. (Cape Town), 7h. (La Paz), 8h. (Helwan), 9h. (La Paz), 11h. (Stonyhurst), 14h. and 19h. (La Paz), 23h. (San Fernando).

April 25d. 16h. 45m. 0s. Epicentre $4^{\circ}0'N$, $130^{\circ}0'E$. (as on 1913 Mar. 26d.).

$$A = -\cdot641, B = +\cdot764, C = +\cdot070; \quad D = +\cdot766, E = +\cdot643;$$

$$G = -\cdot045, H = -\cdot053, K = -\cdot998.$$

Very doubtful.

	Δ °	Az. °	P. m. s.	O—C. s.	S. m. s.	O—C. s.	L. m.	M. m.
Manila	13·8	321	—	—	e 6 17	+14	9·5	10·6
Batavia	25·3	246	5 36	- 5	—	—	—	11·0
Riverview	42·8	154	e 12 6	?	e 14 6	-39	—	18·4
Colombo	50·0	276	21 30	?SR ₁	—	—	—	—
Helwan	95·7	301	28 0	?SR ₁	—	—	—	—
La Paz	158·2	126	20 19	[+13]	—	—	—	—

Additional readings: Manila gives MN = +9·8m. Batavia i = +6m.20s.
Riverview MZ = +18·9m. Helwan PN = +29m.0s.

April 25d. Readings also at 0h. (near Tokyo), 2h. (Rocca di Papa and Athens), 6h. and 7h. (Colombo), 8h. (near Athens), 9h. (Hamburg), 14h. (Taihoku and Helwan), 15h. (Batavia and near Tokyo), 16h. (La Paz and Melbourne), 22h. (San Fernando).

April 26d. Readings at 2h. (near Tokyo and Mizusawa), 7h. (La Paz), 12h. (near Tokyo), 18h. (near Tacubaya), 23h. (San Fernando, Manila, Helwan, and near Barcelona and Tortosa).

April 27d. Readings at 0h. (near Barcelona and Tortosa), 4h. (La Paz), 6h. (Helwan and near Rocca di Papa), 15h. (Manila and near Athens), 16h. (near Oaxaca and Tacubaya), 18h. (near Balboa Heights), 21h. (San Fernando).

April 28d. Readings at 2h. (near Tacubaya), 4h. and 6h. (La Paz), 10h. (near Tokyo), 12h. (San Fernando and La Paz), 17h. (Tortosa), 18h. (Lick), 23h. (San Fernando).

April 29d. Readings at 0h. (La Paz and near Lick), 3h. (near Mizusawa), 6h. (Manila, Batavia, and near Tacubaya), 7h. (near Osaka and near Tokyo, independent shocks), 10h. (Manila and near Tacubaya), 12h. (near Tacubaya), 13h. (La Paz and near Tokyo), 14h. (near Mizusawa), 15h. (Paris and Helwan), 16h. (Riverview, La Paz, Batavia, Manila, and Sydney), 17h. (La Paz), 21h. (Algiers), 22h. (San Fernando).

April 30d. Readings at 1h. (near Lick and near Tokyo), 2h. (Riverview), 3h. (near Tokyo), 5h. (Batavia and La Paz), 9h. (near La Paz), 11h. (near Tacubaya), 14h. (near Tokyo), 19h. (near Tacubaya), 22h. (San Fernando).

May 1d. 6h. 34m. 40s. Epicentre $37^{\circ}0'N$, $28^{\circ}7'E$.

$$A = +.700, B = +.383, C = +.602; \quad D = +.480, E = -.877; \\ G = +.528, H = +.289, K = -.799.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	4.0	286	1 7	+ 5	1 56	+ 6	2.4	2.8
Pompeii	11.6	294	2 59	+ 6	14 20	?	—	—
Rocca di Papa	13.2	296	3 12	— 4	—	—	—	8.9
Moncalieri	17.6	304	3 23	-49	8 2	+31	11.8	—
Strasbourg	19.1	314	4 31	+ 1	e 7 7	-57	—	13.4
Hamburg	21.0	328	4 58	+ 5	e 10 40	?L	14.2	—
Uccle	22.1	316	e 5 4	- 2	e 9 4	- 3	e 12.3	—
Paris	22.3	310	e 5 3	- 6	e 9 4	- 7	13.3	—
De Bilt	E. 22.4	320	—	—	e 9 22	+ 9	e 14.3	15.8
N.	22.4	320	—	—	e 9 20	+ 7	—	15.6

Additional readings: Athens gives PE also at +1m.16s., MN = +2.9m.
Strasbourg MN = +13.3m.

May 1d. Readings also at 2h. (Helwan), 6h. (La Paz), 10h. (Apia), 13h. (Moncalieri), 14h. (Helwan), 16h. (Lick), 18h. (Pompeii), 23h. (Helwan, Eskdalemuir, Kew, Edinburgh, Moncalieri, Calcutta, Simla, Hamburg, Uccle, De Bilt, and Rocca di Papa).

May 2d. 8h. 27m. 50s. Epicentre $35^{\circ}0'N$, $90^{\circ}5'E$. (as on 1919 June 28d.).

$$A = -.007, B = +.819, C = +.574; \quad D = +1.000, E = +.009; \\ G = -.005, H = +.574, K = -.819.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Simla	11.8	255	—	—	e 5 28	+14	7.5	7.7
Calcutta	E. 12.6	189	3 34	+27	—	—	6.2	—
N.	12.6	189	3 28	+21	—	—	6.1	—
Bombay	22.4	229	9 13	?S	(9 13)	0	—	12.6
Zi-ka-wei	26.1	90	e 5 47	- 2	10 28	+ 4	—	16.8
Kodaikanal	27.5	208	10 52	?S	(10 52)	+ 2	14.0	16.0
Taihoku	28.5	102	11 6	?S	(11 6)	- 2	15.3	17.7
Colombo	29.8	202	12 28	?S	(12 28)	+57	22.8	27.7
Nagasaki	32.5	85	e 13 9	?S	(e 13 9)	+53	—	—
Manila	34.2	119	e 10 44	?	—	—	—	—
Osaka	36.3	79	—	—	14 43	+89	—	23.0
Tokyo	39.8	76	22 37	?L	—	—	25.2	29.2
Batavia	44.0	156	—	—	—	e 25.1	23.7	—
Helwan	49.5	282	16 10	?S	(16 10)	- 3	—	—
Vienna	54.7	310	—	—	—	e 30.2	38.2	—
Hamburg	57.2	316	—	—	e 23 46	?SR ₁	e 33.2	34.5
Rocca di Papa	59.3	303	e 43 14	?L	—	—	(e 43.2)	46.4
Strasbourg	60.1	310	—	—	—	—	e 34.9	38.1
De Bilt	60.4	315	—	—	e 25 10	?SR ₁	e 33.2	36.2
Uccle	61.3	315	—	—	—	—	e 33.2	36.7
Moncalieri	61.4	309	—	—	(e 19 34)	+53	35.5	41.8
Dyce	62.5	323	—	—	—	—	35.2	—
Paris	63.2	313	—	—	—	e 41.2	—	—
Kew	63.8	318	—	—	—	—	—	41.2
Eskdalemuir	63.8	321	—	—	—	—	33.2	—
Oxford	64.2	318	—	—	—	—	38.1	—
Barcelona	66.6	307	—	—	—	—	41.5	—
Tortosa	67.9	308	e 39 12	?L	—	—	40.2	44.0
Algiers	68.1	301	—	—	—	—	e 43.7	17.2
San Fernando	N. 74.7	306	44 40	?L	—	—	(e 44.7)	56.2
Chicago	103.2	359	—	—	—	—	e 48.7	—

Additional readings: Zi-ka-wei gives MN = 15.7m. T₀ - 8h.27m.13s.
Osaka MN = +21.8m. Batavia e = +17m.40s. and +22m.6s. Helwan
PN = +20m.10s. Moncalieri gives S = +27m.40s., MN = 41.5m.
Eskdalemuir L = +38.2m. Barcelona e = +40m.10s. San Fernando
PE = +47m.40s., ME = +50.2m. Chicago L = +60.7m.

May 2d. 14h. 46m. 40s. Epicentre $35^{\circ}0'N$. $90^{\circ}5'E$. (as at 8h.).

A = -007, B = +819, C = +574; D = +1000, E = +009;
G = -005, H = +574, K = -819.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Simla		11.8	255	—	—	e 5 38	+24	7.2	8.0
Calcutta	E.	12.6	189	3 8	+1	—	—	6.3	—
	N.	12.6	189	2 56	-11	(5 50)	+16	5.8	—
Bombay		22.4	229	9 16	?S	(9 16)	+3	—	12.6
Zi-ka-wei		26.1	90	e 5 49	0	10 24	0	—	15.9
Kodaikanal		27.5	208	10 32	?S	(10 32)	-18	13.5	16.1
Taihoku		28.5	102	11 6	?S	(11 6)	-2	15.3	18.2
Colombo		29.8	202	12 20	?S	(12 20)	-49	22.8	26.3
Manila		34.2	119	e 10 23	?	—	—	15.0	19.3
Osaka		36.3	79	—	—	15 0	+106	—	21.2
Tokyo		39.8	76	18 43	?L	—	—	22.3	24.5
Batavia		44.0	156	—	—	—	e 25.4	—	—
Helwan		49.5	282	17 20	?S	(17 20)	+67	—	—
Vienna		54.7	310	—	—	—	e 31.4	38.6	—
Hamburg		57.2	316	—	—	e 21 20	?SR ₁	e 33.3	34.5
Rocca di Papa		59.3	303	—	—	—	—	—	43.6
Strasbourg		60.1	310	—	—	—	e 35.3	40.1	—
De Bilt		60.4	315	—	—	—	e 33.3	36.4	—
Uccle		61.3	315	—	—	—	e 32.3	36.7	—
Moncalieri		61.4	309	—	—	(e 19 37)	+56	35.6	41.3
Dyce		62.5	323	—	—	—	i 40.3	—	—
Paris		63.2	313	—	—	e 27 20	?	34.3	36.3
Eskdalemuir		63.8	321	—	—	—	—	34.3	—
Kew		63.8	318	—	—	—	—	—	40.3
Stonyhurst		64.0	319	—	—	—	—	33.8	36.3
Oxford		64.2	318	—	—	—	—	38.3	—
Tortosa		67.9	308	—	—	—	e 39.3	44.0	—
Rio Tinto		74.2	308	44 20	?L	—	—	(44.3)	61.3
Coimbra		74.2	310	40 0	?L	—	—	43.3	45.5
San Fernando		74.7	306	31 32	?L	—	—	(31.5)	50.8
Cape Town		96.4	233	55 8	?L	—	—	(55.1)	57.6
La Paz		153.4	309	92 44	?L	—	—	(92.7)	—

Additional readings: Zi-ka-wei gives MN = +15.8m., T_0 = 14h.46m.43s.
Colombo S = +20m.2s. Manila MN = +18.8m. Osaka MN = +20.6m.
Batavia e = +19m.22s. and e = +22m.56s. Vienna i = +35m.39s.
De Bilt MN = +36.3m. Moncalieri S = +27m.56s., MN = +42.4m.
San Fernando MN = +49.3m. La Paz i = +93m.37s.

May 2d. Readings also at 2h. (Algiers), 5h. (Apia), 6h. (La Paz), 9h. (Pompeii), 13h. (Kew), 14h. (La Paz), 18h. (Batavia and near Tacubaya), 21h. (San Fernando), 22h. (near Tacubaya), 23h. (Rocca di Papa).

May 3d. Readings at 5h. (near Manila (2)), 8h. (Dehra Dun), 13h. (Helwan), 14h. (Apia and Dehra Dun), 16h. (Pompeii), 20h. (Helwan), 23h. (Nagasaki (2)).

May 4d. Readings at 0h. (San Fernando), 1h. (La Paz), 9h. (Manila), 11h. (Manila and Riverview), 12h. (Melbourne and La Paz), 16h. (Athens), 22h. (Helwan), 23h. (Apia and La Paz).

May 5d. 14h. 41m. 55s. Epicentre $45^{\circ}5'N$. $15^{\circ}0'E$. (as on 1918 Aug.13d.).

A = +677, B = +181, C = +713; D = +259, E = -966;
G = +689, H = +185, K = -701.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Padova		2.1	270	0 31	-2	0 51	-7	—	—
Vienna		2.9	19	i 1 9	+24	i 1 17	-3	i 1.8	2.3
Florence		3.1	229	0 50	+1	1 15	-11	—	2.3
Milan		4.0	270	1 52	?S	(1 52)	+2	(2.1)	2.6
Rocca di Papa		4.0	205	e 1 34	+32	—	—	—	3.8
Pompeii		4.8	181	3 5	?	—	—	—	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Zurich	E.	4.8	296	e 1 13	- 1	i 2 7	- 4	—	2.2
	N.	4.8	296	e 1 14	0	i 2 6	- 5	—	2.2
Moncalieri		5.1	269	1 23	+ 4	—	—	—	2.9
Neuchatel		5.8	288	e 1 28	- 2	2 37	- 2	—	—
Strasbourg		5.8	305	1 27	- 3	e 2 17	-22	2.7	2.9
Besançon		6.4	289	1 37	- 1	2 57	+ 2	3.1	3.1
Hamburg		8.7	340	—	—	e 3 17	-39	—	6.6
Uccle		8.8	311	e 2 17	+ 4	—	—	i 4.3	—
Paris		9.1	296	e 3 14	+56	e 3 54	-12	4.6	5.1
De Bilt		9.3	319	—	—	—	—	e 4.4	—
Oxford		12.4	306	—	—	—	—	i 6.3	—

Additional readings : Vienna MZ = +2.1m. Florence S = +1m.11s. Zurich
 iP = +1m.22s. Neuchatel P = +1m.41s. Hamburg MN = +4.9m.,
 MZ = +5.4m.

May 5d. Readings also at 3h. (near Batavia), 4h. (Padova), 6h. (near Mizusawa),
 8h. (Batavia, La Paz, Apia, Honolulu, Helwan, Manila, Riverview,
 and Sydney), 11h. (Manila), 12h. (Manila and Taihoku), 17h. (Manila
 (2)), 18h. (Melbourne), 20h. (near Tacubaya).

May 6d. 9h. 40m. 30s. Epicentre $44^{\circ}0'N$. $131^{\circ}0'E$. (as on 1918 April 10d.).

$$A = -.472, B = +.543, C = +.695; \quad D = +.755, E = +.656; \\ G = -.456, H = +.524, K = -.719.$$

The depth of focus estimated at 0.070 on 1918 April 10d. has been retained
 below. This seems to be indicated by direct comparison of the records of
 the two shocks.

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari		-0.5	8.7	68	1 36	-28	—	—	3.2	4.0
Mizusawa	E.	-0.6	9.0	119	2 4	- 3	3 43	- 4	—	—
	N.	-0.6	9.0	119	2 6	- 1	3 40	- 7	—	—
Osaka		-0.8	9.9	158	2 55	+37	—	—	4.3	4.8
Tokyo		-1.0	10.7	138	2 22	- 4	(4 5)	-16	4.1	4.2
Zi-ka-wei		-1.9	14.9	214	e 3 4	- 9	e 5 32	-12	—	—
Manila		-4.4	30.6	198	e 7 30	? PR ₁	—	—	—	—
Batavia		-6.7	54.7	210	e 8 31	-23	15 24	-30	—	15.6
De Bilt		-7.9	73.2	328	—	—	e 19 35	+ 6	e 43.5	—
Helwan		-8.0	76.1	299	21 30	? S	(21 30)	+87	—	—
San Fernando		-8.6	90.7	327	25 30	? SR ₁	—	—	—	—
La Paz		—	148.2	36	i 18 57	[-56]	25 42	? PR ₁	—	—

Additional readings : Osaka gives MN = +5.3m. Tokyo reads S as L and
 gives S = +3m.9s. Ootomari MN = +3.3m. Helwan PE = +20m.30s.

May 6d. Readings also at 13h. and 16h. (Apia), 18h. (Simla (2) and Calcutta),
 20h. (Lick and Helwan), 21h. (Lick, Manila, and Riverview), 22h.
 (Mizusawa).

1920. May 7d. 5h. 40m. 40s. Epicentre 6°5N. 126°0E.

(as on 1918 Sept. 11d.).

A = -·584, B = +·804, C = +·113; D = +·809, E = +·588;

G = -·066, H = +·092, K = -·994.

The observation of [P] at La Paz suggests a high focus: but on trial it was found that the observations could not be reconciled with that condition.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	9.5	330	2 30	+ 7	(4 31)	+15	4.5	5.8
Taihoku	19.0	347	4 23	- 6	8 2	0	10.5	10.7
Batavia	22.9	237	i 5 22	+ 6	9 34	+11	e 20.6	—
Zi-ka-wei	25.0	351	e 5 30	- 8	e 9 47	-16	e 11.1	17.5
Kobe	29.4	15	6 4	-18	—	—	14.1	15.2
Osaka	29.5	16	6 44	+21	—	—	13.0	20.6
Nagoya	30.4	18	5 37	-55	—	—	—	—
Tokyo	31.8	21	6 57	+12	10 47	-78	13.3	23.5
Mizusawa	35.4	21	6 57	-20	12 28	-33	—	—
Perth	39.6	194	9 34	?PR ₁	(13 25)	-35	13.4	—
Calcutta	E. 39.7	299	7 56	+ 4	—	—	17.7	—
	N. 39.7	299	8 26	+34	13 26	-36	17.8	—
Ootomari	42.7	18	8 0	-16	—	—	—	—
Adelaide	42.9	166	e 9 5	+48	i 14 32	-15	e 21.5	24.3
Colombo	45.9	273	7 50	-49	—	—	14.1	29.4
Riverview	46.8	151	e 8 34	-12	e 15 21	-17	e 20.6	27.7
Sydney	E. 46.9	151	8 38	- 8	15 20	-20	22.5	28.3
Melbourne	47.7	160	—	—	17 8	+78	19.5	19.8
Kodaikanal	48.2	278	1 38	?	—	—	30.8	34.0
Simla	51.8	308	e 9 8	-11	(e 16 26)	-15	e 16.4	29.6
Bombay	53.2	289	9 24	- 3	—	—	—	30.3
Apia	65.0	109	—	—	e 19 26	+ 1	31.3	34.3
Mauritius	71.9	246	23 44	?	—	—	38.7	41.3
Honolulu	74.7	69	i 11 32	-15	i 21 44	+22	38.8	45.9
Helwan	90.8	300	13 20	0	—	—	—	—
Budapest	96.4	319	13 50	- 1	—	—	—	—
Vienna	97.9	320	13 48	-11	24 28	-67	e 36.8	49.8
Victoria	98.6	40	15 29	+86	24 21	-81	36.6	51.4
Hamburg	99.7	327	e 13 55	-14	e 24 23	-90	e 47.3	55.1
Pompeii	E. 101.6	313	17 59	?PR ₁	23 59	-132	38.3	52.3
Strasbourg	102.4	321	e 14 39	+17	—	—	e 48.3	64.4
Rocca di Papa	102.6	315	e 19 3	?PR ₁	24 38	-102	e 52.6	66.4
De Bilt	E. 102.9	327	—	—	e 27 45	+82	e 48.3	56.8
	N. 102.9	327	—	—	—	—	e 49.3	55.7
Dyce	E. 103.7	334	—	—	28 8	+98	54.3	—
Uccle	104.0	326	e 18 32	?PR ₁	e 24 20	-133	e 42.3	64.3
Moncalieri	104.6	320	18 35	?PR ₁	33 44	?SR ₁	49.0	66.1
Besançon	104.8	321	—	—	—	—	61.3	—
Edinburgh	105.0	333	28 5	?S	(28 5)	+83	48.3	65.9
Eskdalemuir	105.4	333	i 18 46	?PR ₁	i 27 47	+61	47.3	—
Stonyhurst	105.9	331	28 20	?S	35 20	?SR ₁	49.5	58.8
Paris	106.1	324	e 14 24	-16	29 20	+147	51.3	56.3
Kew	106.1	328	28 20	?S	(28 20)	+87	—	70.3
Oxford	106.4	328	—	—	i 29 11	+135	49.7	69.5
Cape Town	108.1	235	24 43	?	—	—	—	76.2
Barcelona	109.9	319	—	—	e 28 32	+65	52.0	62.3
Tortosa	111.2	319	19 29	?PR ₁	29 48	+129	e 51.3	68.6
Algiers	111.4	313	e 14 31	-33	21 42	?PR ₁	29.8	69.3
Granada	115.9	316	59 46	?L	—	—	(59.8)	—
Coimbra	E. 117.4	322	—	—	30 48	+139	e 58.9	74.5
	N. 117.4	322	—	—	29 54	+85	e 57.6	65.8
Rio Tinto	117.5	319	21 20	?PR ₁	—	—	—	75.3
San Fernando	118.0	318	23 10	?	—	—	—	81.3
Chicago	122.8	29	i 20 40	?PR ₁	30 34	+84	52.3	—
Ottawa	124.7	18	—	—	—	—	e 54.3	—
Toronto	124.9	20	20 50	?PR ₁	—	—	69.8	87.7
Washington	129.8	21	e 21 26	?PR ₁	31 29	+89	64.8	—
La Paz	162.9	127	20 22	[+12]	34 20	?	78.2	101.8

For Notes see next page.

NOTES TO MAY 7d. 5h. 40m. 40s.

Additional readings and notes: Manila gives also MN = +5.7m. Zi-ka-wei
 PS = +10m.17s., MN = +15.4m., T₀ = 5h.40m.47s. Osaka MN = +16.3m.
 Tokyo 12m. have been added to these readings. Riverview PS =
 +15m.48s., SR₂? = +19m.1s., MNZ = +31.9m. Sydney SR₁E =
 +18m.50s. Mauritius LN = +33.9m., MN = +37.6m. Helwan
 PN = +13m.26s. Adelaide e = +10m.14s., +15m.20s., +18m.38s., and
 +20m.20s., i = +17m.29s. Hamburg PR₁ = 18m.1s., MN = +49.3m.,
 MZ = +61.9m. Strasbourg MN = +56.6m. De Bilt ePR₁ =
 +18m.26s., T₀ = 5h.40m.32s. Epicentre 6°·5N. 127°·6E. Dyce readings
 have been corrected by one hour. Uccle MN = +57.6m. Moncalieri
 MN = +66.8m. Eskdalemuir i = +35m.4s., LN = +50.3m., +56.3m.,
 and +66.3m. Coimbra LE = +39.6m. San Fernando MN = +74.3m.
 Toronto L = +73.1m., eL = +78.0m. Washington eL? = +48.8m.
 La Paz iP = +20m.29s.

1920. May 7d. 21h. 31m. 10s. Epicentre 8.4S. 155.8E.

(As on 1918 June 16d.).

A = -·902, B = +·406, C = -·146; D = +·410, E = +·912;
 G = +·133, H = -·060, K = -·989.

	△	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	25.8	189	e 5 27	-19	10 4	-14	12.1	13.1
Adelaide	30.9	208	e 7 38	+61	e 11 44	-6	i 18.3	—
Melbourne	31.0	197	i 6 26	-12	11 38	-13	14.8	18.2
Apia	32.3	101	e 6 26	-25	e 11 14	-59	13.2	14.8
Christchurch	38.1	160	12 38	?S	(12 38)	-61	17.5	22.3
Manila	41.5	303	e 7 50	-17	—	—	—	—
Perth	43.9	231	8 0	-25	14 57	-4	23.5	26.2
Tokyo	46.6	342	9 5	+21	14 59	-37	18.8	29.0
Osaka	47.2	337	9 22	+34	16 41	+57	21.6	26.3
Taihoku	47.2	318	8 46	-2	15 43	-1	22.0	26.8
Kobe	47.3	338	8 40	-9	15 48	+3	21.4	26.5
Nagasaki	48.0	333	8 44	-10	—	—	e 17.0	—
Batavia	48.5	269	8 52	-5	i 16 4	+4	e 21.4	—
Mizusawa	49.4	349	8 59	-4	16 7	-4	—	—
Zi-ka-wei	51.5	323	e 9 18	+1	e 16 46	+8	24.2	30.5
Honolulu	54.2	56	i 10 8	+34	i 17 20	+9	23.6	33.8
Ootomari	56.3	350	7 57	?S	—	—	16.7	17.3
Calcutta	N. 72.8	299	21 26	?S	(21 26)	+26	—	—
Colombo	77.2	280	13 20	+78	22 20	+29	27.0	34.3
Kodaikanal	80.2	282	22 44	?S	(22 44)	+19	48.5	52.2
Dehra Dun	83.8	303	—	—	23 50?	+43	—	—
Simla	84.7	304	—	—	e 22 44	-32	—	50.7
Sitka	E. 85.9	31	—	—	e 23 8	-21	e 38.3	42.2
	N. 85.9	31	—	—	e 23 9	-20	e 36.2	41.8
Bombay	86.1	290	13 13	+19	—	—	—	—
Berkeley	E. 88.8	51	e 13 2	-7	—	—	e 39.4	—
	N. 88.8	51	13 1	-8	e 23 52	-9	e 37.5	—
Lick	89.3	51	—	—	(e 23 55)	-11	e 23.9	—
Victoria	90.3	41	22 33	?S	(22 33)	-104	39.8	47.6
Mauritius	E. 94.5	250	23 56	?S	(23 56)	-65	43.7	49.9
	N. 94.5	250	23 50	?S	(23 50)	-71	44.5	46.9
Tucson	E. 97.3	59	—	—	—	—	43.6	45.1
Tacubaya	106.7	74	18 52	?PR ₁	29 6	?	48.3	52.6
Chicago	115.3	47	19 32	?PR ₁	29 15	+63	36.8	—
Ann Arbor	E. 118.0	45	—	—	—	—	57.0	74.9
	N. 118.0	45	—	—	—	—	56.5	75.7
Cape Town	121.4	221	30 44	?S	38 14	?SR ₁	—	84.2
Ottawa	122.3	41	e 20 26	?PR ₁	—	—	e 50.8	—
Ithaca	123.0	43	—	—	—	—	56.3	—
Washington	123.8	48	e 20 44	?PR ₁	29 50	+32	60.8	—
Georgetown	123.8	48	—	—	e 27 50	-88	57.2	—
Helwan	E. 124.0	300	21 26	?PR ₁	—	—	—	82.1
	N. 124.0	300	23 26	?	—	—	—	97.5
Cheltenham	E. 124.0	48	22 38	?PR ₁	30 21	+62	60.2	70.6
	N. 124.0	48	42 50	?	—	—	58.6	—
Northfield	124.8	40	—	—	—	—	e 59.8	—
Harvard	E. 126.7	42	e 21 26	?PR ₁	i 38 46	?SR ₁	e 59.3	74.0
	N. 126.7	42	e 20 35	?PR ₁	32 42	?	e 59.3	—
Hamburg	127.1	335	e 19 10	[- 1]	—	—	e 59.8	83.8
Vienna	127.5	328	19 9	[- 3]	32 12	?	e 59.3	65.8

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	129.7	345	20 50	?PR ₁	—	—	54.8	68.0
La Paz	129.9	120	i 19 25	[+ 7]	33 5	?	60.6	112.5
De Bilt	130.2	337	e 21 41	?PR ₁	—	—	e 60.8	72.8
Esksdalemuir	130.2	345	81 38	?	—	—	—	—
Stonyhurst	131.3	341	39 26	?SR ₁	44 20	?	54.5	66.8
Uccle	131.5	337	e 19 20	[- 2]	e 21 44	?PR ₁	e 57.8	70.7
Padova	131.7	329	20 15	[+ 53]	27 35	?	—	82.4
Strasbourg	131.7	329	e 19 22	[0]	—	—	c 62.8	73.2
Oxford	132.7	340	e 21 46	?PR ₁	—	—	54.7	86.2
Kew	132.7	340	40 50	?	—	—	—	74.8
Pompeii	E. 132.9	320	19 24	[- 1]	21 59	?PR ₁	68.8	71.8
Rocca di Papa	133.4	322	e 18 54	[- 32]	31 28	?	e 67.9	77.9
Besançon	133.5	332	19 32	[5]	—	—	68.8	—
Paris	133.7	337	i 19 30	[+ 3]	—	—	62.8	67.8
Moncalieri	134.2	328	19 34	[+ 6]	34 9	?	54.7	86.8
Vieques	E. 138.8	71	—	—	—	—	66.5	67.7
Barcelona	139.5	330	19 46	[- 7]	40 22	?SR ₁	65.9	73.8
Tortosa	140.8	331	18 22	[- 78]	32 23	?	64.0	80.7
Columbra	E. 145.2	339	19 34	[- 14]	—	—	e 61.8	76.8
	N. 145.2	339	19 46	[- 2]	—	—	e 68.8	80.6
Granada	145.7	331	19 53	[- 4]	—	—	—	—
Rio Tinto	146.6	335	20 50	[- 59]	—	—	—	90.8
San Fernando	147.5	332	20 6	[- 14]	30 50	?	—	84.8

Additional readings and notes: Riverview gives also iP = -5m.35s. and -6m.9s., S = +10m.22s., T₀ = 21h.30m.42s. Epicentre 8° 5S. 144° 0E. Apia eP = +7m.14s. Ootomari MN = +17.7m., all these readings are increased by 10m. Perth SR₁ = +19m.2s. Tokyo 12m. are added to all readings. Osaka MN = -24.9m., T₀ = 21h.31m.21s. Kobe SN = -15m.49s., MN = -26.3m. Nagasaki readings are increased by 11m. Batavia i = +11m.13s. and -13m.22s., iE = -17m.44s. Mizusawa PN = -8m.58s., T₀ = 21h.31m.9s. Zi-ka-wei MN = +30.8m., T₀ = 21h.31m.6s. Berkeley ePV = +12m.53s., T₀ = 21h.31m.0s. Victoria S = 29m.27s. L (recrudescence) 2h.20.0m. Tacubaya LN = +48.4m., MN = +52.7m. Ann Arbor gives E Bosche-Omori and N Wiechert, also LE (Wiechert) = +57.2m. Ottawa gives L = +63.8m., +74.8m. and +88.8m. Georgetown eLE? = +32.4m., eLN? = +32.5m., LN = +42.9m. Hamburg iZ = +21m.17s., eSR₁ = +38m.26s., e = +45m.34s., MNZ = +73.9m. Vienna iE = +21m.27s. Edinburgh P = +39m.9s., PS = +41m.33s., SR₂ = +53m.26s. La Paz SR₁ = +38m.40s., T₀ = 21h.33m.54s. De Bilt iE = +22m.44s., iN = +22m.48s., MN = +77.9m., T₀ = 21h.30m.42s. Uccle MN = +82.0m. Strasbourg MN = +77.6m. Paris PR₁ = +22m.57s. Moncalieri iP = 22m.3s., MN = +22.9m. All readings given one hour late. Barcelona i = +35m.1s. San Fernando MN = +90.3m.

May 7d. Readings also at 1h. (Lick and La Paz), 5h., 9h., and 10h. (La Paz), 12h. (Dyce and Algiers), 13h. (La Paz), 15h. (Helwan), 17h. (Balboa Heights), 21h. (Stonyhurst), 23h. (Mauritius).

May 8d. 21h. 3m. 50s. Epicentre 56° 0N. 136° 0W. (as on 1919 May 18d.).

A = -402, B = -389, C = +829; D = -695, E = +719;
G = -596, H = -576, K = -559.

The origin should be rather further west, but the old origin is retained for convenience.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria	10.8	129	2 43	+ 2	—	—	—	8.1
Lick	E. 21.0	147	—	—	—	—	e 10.8	—
Chicago	33.9	93	13 10	?S	(13 10)	+31	(23.9)	—
Toronto	37.3	84	—	—	—	—	30.0	31.2
Ottawa	38.3	79	—	—	—	—	24.2	—
Washington	41.8	88	—	—	—	—	19.2	—
Harvard	42.7	80	—	—	—	—	e 28.9	—
Edinburgh	61.8	28	—	—	—	—	48.2	—
Stonyhurst	63.8	28	42 20	?L	—	—	(42.3)	—
De Bilt	67.3	25	—	—	—	—	e 37.2	45.5
Uccle	68.2	25	—	—	—	—	e 38.2	—
Paris	69.7	28	—	—	—	—	e 50.2	—
Granada	78.4	37	47 13	?L	—	—	(47.2)	—

Additional readings: Lick gives eLN = 10.3m. Harvard LE = +30.4m. and +33.1m., LN = +31.2m.

May 8d. Readings also at 0h. (Riverview, Adelaide, and Melbourne), 1h. (near Balboa Heights), 3h. (near Lick and Tokyo), 5h. (Dehra Dun), 6h. (Sapporo and Tacubaya), 7h. (Manila and near Rocca di Papa and Pompeii), 8h. (Tacubaya), 19h. (La Paz), 20h. (Berkeley and Chicago), 22h. (La Paz), 23h. (La Paz, Chicago, Toronto, Ottawa, Washington, De Bilt, and Victoria).

May 9d. 8h. 0m. 4s. Epicentre $51^{\circ}7'S$. $173^{\circ}8'E$.

$$A = -.616, B = +.067, C = -.785; \quad D = +.108, E = +.994; \\ G = +.780, H = -.085, K = -.620.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	24.2	309	e 5 30	0	e 9 48	0	e 12.2	13.9
Melbourne	24.5	294	—	—	—	—	e 12.9	18.5
Perth	46.0	272	24 56	?L	—	—	(24.9)	—
Honolulu	77.1	28	21 50	?S	(21 50)	0	23.9	30.8
Victoria	113.5	39	39 28	?SR ₁	—	—	—	44.9
Chicago	126.3	67	18 41	[-28]	28 36	-59	e 54.9	—
Toronto	132.2	69	—	—	e 27 26	?	31.0	—
Helwan	144.9	247	25 56	?PR ₁	—	—	—	—
Paris	173.7	246	—	—	—	—	e 72.9	—

No additional readings.

May 9d. 17h. 9m. 20s. Epicentre $9^{\circ}8'N$. $126^{\circ}2'E$.

$$A = -.582, B = +.795, C = +.170; \quad D = +.807, E = +.591; \\ G = -.101, H = +.137, K = -.985.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	7.0	314	e 1 42	- 4	—	—	—	—
Taihoku	15.9	344	e 3 54	+ 3	—	—	7.9	—
Zi-ka-wei	21.9	349	5 3	- 1	e 9 1	- 2	—	—
Batavia	25.0	231	5 43	+ 5	—	—	—	11.2
Helwan	89.3	300	59 40	?L	—	—	(59.7)	—
Hamburg	97.0	328	—	—	—	—	e 50.7	—
De Bilt	100.3	326	—	—	—	—	e 50.7	54.4
Rocca di Papa	100.4	315	—	—	—	—	e 53.7	55.7
Uccle	101.4	327	—	—	—	—	e 49.7	53.7
Eskdalemuir	102.5	332	—	—	—	—	52.7	—
Paris	103.4	325	—	—	—	—	e 54.7	—

Additional readings: Helwan gives $PN = +53m.40s$. De Bilt $MN = +53.8m$. Epicentre $11^{\circ}5'N$. $123^{\circ}8'E$.

May 9d. Readings also at 0h. (Paris), 4h. (Taihoku), 7h. (La Paz), 9h. (Helwan and near Tacubaya), 11h. (near Kobe), 13h. (La Paz), 14h. (Lick), 16h. (Edinburgh and La Paz), 18h. (Osaka), 22h. (Lick).

1920. May 10d. 18h. 49m. 40s. Epicentre $5^{\circ}5'S$. $130^{\circ}0'E$.

$$A = -.640, B = +.763, C = -.096; \quad D = +.766, E = +.643; \\ G = +.062, H = -.073, K = -.995.$$

A depth of focus 0.060 has been assumed.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	-2.7	22.0	336	e 4 33	0	—	—	9.2	—
Batavia	-2.8	23.0	267	4 42	- 1	i 9 56	? 1.	(i 9.9)	10.4
Perth	-3.7	29.6	205	5 38	9	11 50	+ 90	17.9	—
Adelaide	-3.8	30.5	166	i 5 50	- 5	i 10 26	- 9	i 11.9	17.8
Riverview	-4.2	34.5	148	6 32	+ 1	11 36	- 3	e 14.9	25.0
Sydney	-4.2	34.5	148	6 26	- 5	11 32	- 7	17.9	19.8
Melbourne	-4.2	35.1	160	6 44	+ 7	12 2	+ 12	14.5	22.2
Zi-ka-wei	-4.5	37.6	350	e 6 55	- 2	e 12 16	- 10	—	66.7
Kobe	-4.7	40.5	8	7 19	- 1	—	—	16.2	17.0
Tokyo	-4.9	42.2	12	7 21	- 11	—	—	7.5	7.6

Continued on next page.

		Corr. for Focus	Δ	Az.	P.		O-C.		S.		O-C.	L.	M.
					m.	s.	s.	s.	m.	s.	s.	m.	m.
Mizusawa	E.	-5.2	45.8	13	7	50	-10		14	22	+7	—	—
	N.	-5.2	45.8	13	7	49	-11		14	21	+6	—	—
Calcutta		-5.5	49.5	308	15	14	?S		(15	14)	+12	—	—
Colombo		-5.6	51.6	282	8	38	-2		10	26	?PR ₁	11.6	22.3
Christchurch		-5.8	53.4	141	—	—	—		16	20	-31	34.1	35.3
Kodaikanal		-5.9	54.7	286	9	2	+3		—	—	—	32.1	33.3
Apia		-6.1	57.9	102	—	—	—		—	—	—	—	16.3
Mauritius		-6.8	71.3	251	—	—	—		—	—	—	—	6.6
Honolulu		-7.0	75.4	66	i	11	50	+43	i	21	14	+67	e 37.0
Helwan		-7.8	100.2	300	17	32	?		—	—	—	—	—
Cape Town	E.	-8.0	104.4	233	19	19	?PR ₁		24	49	-31	—	27.5
Victoria		—	105.1	41	22	25	?		30	46	?SR ₁	42.6	53.9
Berkeley	E.	—	107.3	50	23	55	?		—	—	—	—	—
Lick		—	107.9	51	—	—	—		—	—	—	e 56.4	—
Vienna		—	109.7	320	e	17	37	?	i	27	37	+12	—
Hamburg		—	111.8	326	e	19	53	?PR ₁	—	—	—	e 55.3	65.1
Pompeii		—	112.7	311	15	28	+18		—	—	—	—	—
Rocca di Papa		—	113.8	313	e	18	20	13	—	—	—	e 51.8	—
Strasbourg		—	115.0	321	e	19	14	?PR ₁	e	29	37	-87	e 59.3
De Bilt		—	115.1	325	—	—	—		e	26	36	-95	e 59.3
Uccle		—	116.1	324	e	19	14	?PR ₁	26	46	-93	—	—
Moncalieri		—	116.3	319	e	11	34	?	26	47	-93	41.7	73.1
Dyce	N.	—	116.3	334	20	22	?PR ₁		26	50	-90	—	63.8
Edinburgh		—	117.5	331	e	20	44	?PR ₁	30	14	+104	—	62.6
Eskdalemuir		—	117.8	331	20	14	?PR ₁	i	27	1	-91	—	—
Paris		—	118.1	323	e	19	28	?PR ₁	e	27	7	-88	34.3
Stonyhurst		—	118.3	330	21	38	?PR ₁		28	50	+14	39.3	60.3
Kew		—	118.4	328	—	—	—		—	—	—	—	66.3
Oxford		—	118.8	328	19	56	?PR ₁		—	—	—	—	—
Algiers		—	122.4	310	e	19	53	?PR ₁	31	10	+123	43.3	78.3
Tortosa		—	122.8	316	18	37	[-23]		36	33	?SR ₁	60.3	76.4
Granada		—	127.2	312	e	18	30	[-42]	30	50	+69	—	—
Coimbra		—	129.1	319	22	6	?PR ₁		36	30	?PR ₁	e 53.6	—
San Fernando		—	129.4	313	21	32	?PR ₁		—	—	—	—	76.3
Chicago		—	130.7	37	21	44	?PR ₁		32	32	?	61.3	—
Toronto		—	133.9	28	21	44	?PR ₁		28	38	?	33.1	42.3
Washington		—	138.6	30	21	56	?PR ₁		—	—	—	—	—
La Paz		—	151.6	141	i	19	30	[-28]	32	55	?	78.5	95.1

Additional readings and notes: Batavia gives $iP = +5m.31s.$, $eL = +21.3m.$, $T_0 = 18h.49m.38s.$, Adelaide $i = +8m.14s.$, and $+10m.50s.$ River-view $iP = +6m.36s.$, $iPR = +7m.57s.$, $i = +11m.41s.$, $PR_1 = +11m.51s.$, $iSR_2 = +14m.15s.$, $MZ = +17.0m.$, $MN = +20.3m.$, $T_0 = 18h.49m.52s.$ Sydney $PR_2 = +7m.56s.$ Zi-ka-wei $MN = +79.6m.$ Kobe $MN = +17.6m.$ Calcutta $PN = +15m.8s.$ Christchurch $PR_1 = +9m.8s.$ Mauritius gives $P = 18h.44m.12s.$ earlier than T_0 . It would seem that some time correction is required. Helwan $PN = +20m.20s.$ ($?PR_1N$). Victoria $eL = +51.4m.$ Berkeley $e?N = +24m.10s.$ Hamburg $ePR_1 = +27m.45s.$, $eSR_1 = +38m.25s.$, $MN = +58.3m.$ Strasbourg $PR_1?N = +28m.22s.$, $MN = +62.8m.$ De Bilt $ePR_1 = +19m.22s.$, $MN = +65.6m.$ Epicentre $5^\circ 9'S$, $130^\circ 4'E$. Uccle $i = +28m.32s.$ Dyce $iN = +40m.0s.$, $iE = +30m.2s.$ Edinburgh $SR_1 = +35m.32s.$ Eskdalemuir $iE = +28m.45s.$ Granada $i = +20m.4s.$ Coimbra $PR_1E = +29m.58s.$, $PR_1N = +30m.24s.$, $i = +38m.6s.$, $L = +67.7m.$ San Fernando $MN = +79.3m.$ Toronto $eL = +39.2m.$, also $eL = +73.9m.$, $M = +75.9m.$, and $eL = +87.2m.$, $M = +90.3m.$, which, although given separately, are probably connected with this earthquake. La Paz gives $L = +65.2m.$ and $+87.5m.$

May 10d. Readings also at 0h. (near Rocca di Papa), 10h. (La Paz), 11h. (Helwan), 13h. (La Paz and Balboa Heights), 17h. (2) and 19h. (Tokyo), 20h. (Stonyhurst (2)).

May 11d. Readings at 0h. (San Fernando), 2h. (Riverview), 5h. (La Paz), 6h. (near Mizusawa and Tokyo), 11h. (Manila), 15h. (La Paz), 19h. (near Tokyo), 21h. (near Algiers, San Fernando, De Bilt, and Tortosa).

May 12d. 21h. 53m. 12s. Epicentre $38^{\circ}0'N$. $136^{\circ}0'E$.

A = -567, B = +547, C = +616; D = +695, E = +719;
G = -443, H = +428, K = -788.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagoya	2.9	166	0 33	-12	—	—	—	—
Tokyo	3.3	166	0 20	-32	—	—	0.6	—
Osaka	3.4	188	0 51	-2	(1 27)	-7	1.4	1.8
Kobe	3.4	192	0 50	-3	—	—	1.6	1.6
Mizusawa	E. 4.1	74	1 5	+1	1 54	+1	—	—
	N. 4.1	74	1 4	0	1 55	+2	—	—
Nagasaki	7.3	225	1 54	+3	—	—	3.4	4.0
Zi-ka-wei	13.8	245	i 3 31	+8	e 5 57	-6	—	—
Taihoku	17.9	227	3 59	-17	(7 17)	-21	7.3	—
Manila	27.0	214	e 5 52	-6	—	—	13.1	—
Batavia	51.9	219	—	—	i 15 49	-54	—	—
Hamburg	77.3	330	e 12 2	-1	i 22 2	+10	—	42.8
Vienna	78.5	324	i 12 8	-2	22 27	+21	—	55.0
De Bilt	80.3	331	—	—	e 22 26	-1	43.8	50.4
Eskdalemuir	80.4	339	23 17	?S	(23 17)	+49	41.3	—
Uccle	81.6	331	e 12 23	-5	22 34	-8	—	46.8
Strasbourg	82.0	329	e 12 26	-4	e 22 36	-10	50.8	—
Padova	82.6	324	12 48	+14	23 33	+40	—	—
Kew	82.7	335	—	—	—	—	—	59.8
Oxford	82.8	335	—	—	i 22 42	-13	—	—
Pompeii	84.8	320	15 37	?PR ₁	22 48	-29	—	—
Rocca di Papa	85.0	321	e 16 15	?PR ₁	e 23 15	-4	e 56.2	58.7
Moncalieri	85.4	325	e 16 9	?PR ₁	i 23 13	-10	37.2	—
Tortosa	91.3	328	21 31	?	—	—	e 33.2	51.2
San Fernando	97.8	330	37 48	?	—	—	—	—
La Paz	149.8	51	19 37	[-19]	—	—	—	—

Additional readings: Osaka gives MN = +2.2m.
MN = +46.0m. Epicentre $34^{\circ}7'N$. $139^{\circ}3'E$.

De Bilt ePR₁ = +15m.36s.,

May 12d. Readings also at 0h. (San Fernando), 7h. (near Mizusawa), 9h. (Taihoku and Zi-ka-wei), 14h. (La Paz), 18h. (Riverview), 21h. (Moncalieri, De Bilt, Uccle, and Helwan).

1920. May 13d. 1h. 48m. 25s. Epicentre $4^{\circ}0'S$. $144^{\circ}5'E$.

(as on 1918 June 10d.).

A = -812, B = +579, C = -070; D = +581, E = +814;
G = +057, H = -041, K = -998.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	29.8	309	e 6 13	-13	—	—	14.4	16.7
Riverview	30.5	169	e 6 29	-4	i 11 37	-6	e 15.0	18.4
Sydney	30.5	169	—	—	11 35	-8	15.3	18.2
Adelaide	31.4	189	e 7 5	+23	i 11 41	-17	e 14.7	23.4
Melbourne	33.8	179	—	—	12 29	-9	15.8	24.2
Taihoku	36.6	323	7 20	-7	(13 0)	-18	13.0	20.6
Batavia	37.6	265	7 29	-6	—	—	21.6	10.9
Perth	38.8	221	7 32	-12	13 38	-11	19.2	21.2
Osaka	39.6	348	7 51	0	13 8	-52	16.6	16.7
Kobe	39.6	348	7 37	-14	—	—	e 16.7	19.2
Tokyo	39.9	355	8 16	+22	13 50	-15	17.2	24.2
Nagoya	40.5	350	e 8 3	+4	—	—	—	—
Zi-ka-wei	E. 41.5	330	7 58	-9	14 12	-16	18.7	22.6
Mizusawa	N. 43.2	356	8 9	-11	14 31	-20	—	—
Christchurch	46.7	150	8 41	-4	15 47	+10	24.3	34.5
Ootomari	50.7	359	8 32	-39	16 22	-5	21.2	22.0
Honolulu	61.7	63	e 9 59	-24	i 18 17	-27	32.0	40.2
Colombo	65.5	276	19 35	?S	(19 35)	+4	23.8	24.6
Kodaikanal	68.3	283	19 35	?S	(19 35)	-31	43.1	45.7

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Simla	72.9	305	—	—	e 20 53	- 8	36.3	43.3
Bombay	74.1	291	11 52	+ 9	—	—	—	—
Mauritius	85.4	250	22 47	?S	(22 47)	-39	32.9	48.1
Sitka	88.0	33	—	—	—	—	e 39.9	44.6
Victoria	94.4	42	24 48	?S	(24 48)	-12	41.5	48.9
Berkeley	94.9	52	13 24	-19	—	—	e 43.2	—
Lick	95.5	53	e 17 39	?	e 25 42	+31	e 43.6	—
Tucson	105.5	57	—	—	—	—	48.1	52.6
Helwan	112.0	301	19 47	?PR ₁	—	—	—	78.3
	112.0	301	27 59	?S	(27 59)	+13	—	111.9
Cape Town	116.5	229	29 39	?S	(29 39)	+77	—	69.2
Vienna	117.5	324	e 19 2	[+18]	i 26 47	-103	—	68.1
Hamburg	118.1	331	e 20 23	?PR ₁	e 30 9	+94	e 52.6	61.6
Chicago	120.2	42	20 43	?PR ₁	30 15	+84	e 52.6	—
Dyce	120.7	340	—	—	30 49	+114	64.8	69.3
De Bilt	121.4	332	—	—	e 30 31	+91	e 54.6	62.8
Padova	121.6	323	20 35	?PR ₁	30 35	+94	—	—
Edinburgh	122.1	339	29 55	?S	(29 55)	+50	49.6	58.3
Pompeii	122.1	317	19 43	[+58]	29 13	+ 8	47.6	71.6
Strasbourg	122.3	326	e 20 34	?PR ₁	e 30 41	+95	e 59.6	73.2
Eskdalemuir	122.5	339	15 0	-55	e 24 24	?	58.6	—
Uccle	122.6	330	e 20 35	?PR ₁	30 35	+86	50.6	63.4
Ann Arbor	122.6	40	21 29	?PR ₁	32 17	+188	62.5	—
	122.6	40	20 59	?PR ₁	31 53	+164	62.4	—
	122.6	40	21 35	?PR ₁	32 59	+230	—	—
Rocca di Papa	122.8	319	e 19 13	[+13]	e 25 35	?	60.5	67.4
Stonyhurst	123.4	337	32 17	?	38 5	?SR ₁	51.1	60.6
Toronto	124.0	37	—	—	32 11	?	i 67.3	80.9
Besançon	124.0	326	—	—	—	—	62.6	—
Kew	124.2	334	26 35	?	—	—	—	78.6
Moncalieri	124.3	320	20 58	?PR ₁	37 9	?SR ₁	60.1	80.0
Oxford	124.5	335	21 0	?PR ₁	32 27	?	54.1	67.1
Paris	124.8	326	—	—	e 28 44	-41	56.6	64.6
Ithaca	127.0	37	—	—	e 38 15	?SR ₁	60.2	—
Northfield	128.2	32	—	—	—	—	e 66.6	—
Georgetown	128.7	42	e 21 35	?PR ₁	31 39	+107	62.6	—
	128.7	42	e 21 35	?PR ₁	31 40	+108	e 58.6	—
	128.7	42	e 20 51	?PR ₁	—	—	62.0	—
	128.7	42	e 21 25	?PR ₁	—	—	e 55.6	—
Washington	128.9	41	—	—	—	—	73.2	75.6
Cheltenham	128.9	41	—	—	—	—	66.8	74.8
	128.9	41	—	—	—	—	56.0	69.1
Barcelona	129.7	323	21 42	?PR ₁	—	—	—	—
Harvard	130.3	34	e 21 33	?PR ₁	33 25	?	e 57.3	—
	130.3	34	e 21 23	?PR ₁	—	—	e 57.3	64.0
Tortosa	131.1	324	21 29	?PR ₁	33 32	?	56.2	80.8
Algiers	131.8	319	e 19 35	[+12]	28 40	?	39.6	67.6
Granada	135.8	323	19 50	[+18]	—	—	—	—
Coimbra	136.3	330	22 8	?PR ₁	34 34	?	e 60.6	68.6
	136.3	330	—	—	—	—	68.6	83.3
Rio Tinto	137.2	327	23 35	?PR ₁	—	—	—	85.6
San Fernando	137.9	324	—	—	44 35	?SR ₁	79.6	117.6
La Paz	141.8	123	e 19 50	[+ 7]	31 55	?	60.6	73.2

Additional readings: Manila gives also MN = +16.6m. Riverview iSR₁ = +13m.43s., SR₂ = +14m.25s., MZ = +21.2m., MN = +21.4m., T₀ = 1h.48m.25s., Adelaide i = +12m.23s. and +12m.59s. Osaka MN = +19.4m., T₀ = 1h.49m.36s. Kobe MN = +19.0m. Zi-ka-wei SN = +14m.10s., SR₂N = +16m.6s., SR₂N = +17m.33s., SR₂N = +18m.13s., MN = -20.5m., T₀ = 1h.48m.33s. Mizusawa SE = +14m.27s., T₀ = 1h.48m.36s. Christchurch SR₁ = +19m.35s. Colombo S = +19m.53s. Mauritius PN = +23m.11s. Victoria S = +30m.42s., L (repetition) = 4h.9m.50s. Hamburg SR₁ = +36m.38s., SR₂ = +41m.13s., MN = +74.6m., MZ = +71.6m. De Bilt PR₁ = +20m.45s., e = +37m.47s., MN = +70.4m., T₀ = 1h.57m.22s. Edinburgh gives S as P and S as = +37m.32s. Eskdalemuir L? = +37.6m. Strasbourg PR₁E = +21m.5s., MN = +72.8m. Uccle SR₁ = +37m.53s., MN = +62.6m. Toronto gives its readings as on 12d., also L or S = +38m.29s., L = +56.5m., L Rep = +130.3m. Moncalieri MN = +74.7m. Paris e₂ = +42m.35s. (?SR₁). Georgetown LN = +61.6m. Harvard iPE = +21m.42s., iPN = +22m.4s., giving all its readings as on 12d. Algiers PR₁ = -23m.0s. Coimbra LN? = +45.5m., LE? = +48.8m. San Fernando MN = +123.6m. La Paz gives L = +69.6m.

May 13d. 4h. 40m. 40s. Epicentre $49^{\circ}8'N$. $12^{\circ}0'E$.

$$A = +.631, B = +.134, C = +.764.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Strasbourg		3.1	216	e 1 48	?L	—	—	(e 1.8)	—
Zurich	E.	3.3	223	e 0 53	+ 1	1 35	+ 4	—	—
	N.	3.3	223	e 0 54	+ 2	1 34	+ 3	—	—
Vienna		3.3	118	e 0 46	- 6	1 26	- 5	—	1.6
Padova		4.4	181	1 4	- 4	1 21	-40	—	—
Rocca di Papa		8.1	176	e 2 2	- 1	—	—	—	3.4

Rocca di Papa gives also ePE = +2m.26s., iN = +2m.34s.

May 13d. Readings also at 8h. (Batavia), 14h. (Apia), 21h. (San Fernando).

May 14d. 17h. 57m. 10s. Epicentre $64^{\circ}1'N$. $27^{\circ}5'W$. (as on 1914 June 19d.).

$$A = +.388, B = -.202, C = +.900; \quad D = -.462, E = -.887; \\ G = +.798, H = -.415, K = -.437.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Edinburgh		14.5	113	—	—	—	—	6.8	8.5
Eskdalemuir		14.6	112	—	—	—	—	5.8	—
Oxford		18.4	120	—	—	7 52	+ 3	9.9	13.9
Kew		19.0	119	—	—	—	—	—	11.8
De Bilt		20.6	110	e 4 56	+ 7	—	—	e 9.8	13.2
Uccle		21.3	113	—	—	e 8 38	-12	e 10.3	—
Hamburg		21.6	101	e 8 50	?S	(e 8 50)	- 7	(e 17.8)	—
Paris		22.2	119	e 7 12	?	—	—	11.8	12.8
Strasbourg		24.4	112	e 5 36	+ 4	e 9 50	- 2	e 12.8	—
Coimbra	N.	26.4	146	9 20	?	12 36	?	14.4	—
Moncalieri		27.3	117	—	—	e 10 37	- 9	14.2	—
Vienna		28.3	103	e 6 20	+ 9	—	—	—	19.3
Tortosa		28.4	131	6 30	+18	11 2	- 4	14.6	18.2
Barcelona		28.7	128	e 8 50	?	—	—	e 15.0	18.8
San Fernando	N.	30.4	145	11 26	?S	(11 26)	-15	—	18.8
Rocca di Papa		32.0	114	i 6 50	+ 3	—	—	20.5	21.8
Algiers		32.9	131	—	—	—	—	e 19.5	20.3
Toronto		35.3	261	—	—	—	—	34.1	—
Helwan		49.9	104	34 50	?L	—	—	(34.8)	—
Victoria		50.0	300	26 41	?L	—	—	(26.7)	29.2

Additional readings: De Bilt gives MN = +12.1m. Coimbra eE = +10m.40s. ?S, LE = +15.1m. Helwan PN = +31m.50s.

May 14d. Readings also at 2h. (near Lick), 5h. (Apia), 6h. (near Lick), 12h. (near La Paz), 13h., 14h., and 16h. (Helwan), 21h. (Manila and near La Paz), 23h. (near Tokyo).

May 15d. Readings at 0h. (San Fernando), 2h. (Zi-ka-wei), 3h. (Pompeii, Zi-ka-wei, Taihoku, Padova, Rocca di Papa, and Manila), 4h. (Manila and near De Bilt), 5h. (near Zurich), 6h. (near Tokyo), 9h. (La Paz), 11h. (Rocca di Papa), 12h. (De Bilt, Hamburg, Paris, and Vienna), 17h. (Helwan), 18h. (La Paz).

May 16d. 21h. 11m. 15s. Epicentre $7^{\circ}5'N$. $121^{\circ}5'E$. (suggested by De Bilt).

$$A = -.518, B = +.846, C = +.130; \quad D = -.853, E = -.522; \\ G = -.068, H = +.111, K = -.991.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila		7.2	356	1 57	+ 8	(3 21)	+ 6	3.4	4.1
Batavia		20.0	227	4 41	0	1 8 41	+18	—	13.0
Zi-ka-wei		23.7	0	e 5 0	-25	e 10 6	+28	—	—
Colombo		41.2	271	23 45	?L	—	—	(23.8)	29.8
Helwan		86.5	299	55 45	?L	—	—	(55.8)	—
De Bilt		99.7	325	—	—	e 24 27	-86	52.8	64.0
Uccle		100.6	324	—	—	—	—	e 50.8	—
Paris		102.6	323	—	—	—	—	e 60.8	—
La Paz		167.0	135	20 9	[- 4]	—	—	—	—

Additional readings: Manila gives MN = +3.8m. Helwan PN = +56m.45s. De Bilt MN = +54.6m. Epicentre $7^{\circ}5'N$. $121^{\circ}5'E$. (as adopted).

May 16d. Readings also at 1h. (San Fernando), 3h. (Zi-ka-wei and near Taihoku), 4h. (Edinburgh, De Bilt, and near Lick), 5h. (La Paz), 6h. (Helwan), 7h. (La Paz and near Manila), 10h. (Taihoku), 15h. (Apia).

May 17d. Readings at 1h. (San Fernando, Sydney, and near Lick), 6h. (Manila), 20h. (Harvard and near Athens), 21h. (near Athens), 22h. (Florence and near Athens), 23h. (Lick).

May 18d. Readings at 2h. (San Fernando, Florence, and Rocca di Papa), 3h. (Ootomari, Mizusawa, and La Paz), 7h. (near Zurich), 11h. (near River-view and Melbourne), 12h. and 13h. (Paris), 16h. (Paris and near Osaka, Kobe, and Tokyo), 18h. (La Paz).

May 19d. 3h. 11m. 0s. Epicentre $3^{\circ}0'N$, $122^{\circ}0'E$. (as on 1913 Jan 11d.).

A = -·529, B = +·847, C = +·052 ; D = +·848, E = +·530 ;
G = -·028, H = +·044, K = -·999.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	11·3	5	2 43	- 6	5 3	+ 1	5·5	6·3
Batavia	17·7	239	i 3 24	-49	6 31	-62	—	9·6
Taihoku	22·0	359	5 15	+10	—	—	9·5	—
Zi-ka-wei	28·0	2	e 5 42	-26	—	—	—	—
Perth	35·4	189	7 40	+23	—	—	18·3	—
Adelaide	41·1	159	i 12 6	?	i 13 48	-34	e 18·0	23·6
Colombo	42·3	278	16 0	?S	(16 0)	+81	29·0	35·0
Sydney	46·0	146	8 42	+ 2	—	—	20·5	22·1
Riverview	46·0	146	e 13 18	?	e 16 31	+63	e 20·2	25·2
Melbourne	46·0	152	13 42	?	16 54	+86	19·3	26·0
Simla	50·7	309	—	—	—	—	28·8	—
Honolulu	79·5	69	e 22 30	?S	(22 30)	+12	43·0	47·0
Helwan	89·0	300	23 0	?S	(23 0)	-63	—	—
Zante	98·6	310	9 0	?	—	—	—	—
Hamburg	100·3	326	—	—	—	—	e 54·0	—
De Bilt	103·7	325	—	—	—	—	e 55·0	71·8
Uccle	104·6	324	—	—	—	—	e 52·0	—
Edinburgh	106·1	332	—	—	—	—	56·0	—
La Paz	163·2	144	19 25	[-45]	28 25	?	41·7	45·0

Additional readings: Manila gives $e = +2m.36s.$, MN = +6·6m. Riverview
MN = +26·2m. Riverview and Melbourne seem to record a different
shock not registered elsewhere. Helwan PN = +22m.0s. De Bilt
MN = +65·2m. Epicentre $0^{\circ}2'S$, $124^{\circ}5'E$.

May 19d. 3h. 21m. 30s. Epicentre $34^{\circ}0'N$, $21^{\circ}0'E$.

A = +·774, B = +·297, C = +·559 ; D = +·358, E = -·934 ;
G = +·522, H = +·200, K = -·829.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	4·5	29	1 19	+ 9	—	—	1·9	2·5
Pompeii	8·5	325	e 2 11	+ 2	(3 1)	-49	—	3·8
Rocca di Papa	10·1	322	2 12	-18	4 38	+ 6	—	5·0
Padova	13·4	331	5 30	?S	(5 30)	-23	(7·9)	—
Vienna	14·7	348	e 3 55	+20	i 6 36	+11	i 7·2	7·8
Moncalieri	15·0	321	—	—	e 6 51	+19	—	—
Batavia	90·0	98	—	—	—	—	e 42·7	44·4

Athens gives MN = +2·2m.

May 19d. 12h. 41m. 33s. Epicentre $6^{\circ}5S. 126^{\circ}0E.$

A = -584, B = +804, C = -113; D = +809, E = +588;

G = +067, H = -092, K = -994.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Batavia	19.0	270	4 23	- 6	i 8 21	+19	—	13.4
Manila	21.7	346	e 4 58	- 3	8 53	- 6	10.5	—
Perth	27.2	199	13 47	?L	—	—	(13.7)	26.6
Adelaide	30.8	159	—	—	—	—	e 20.4	—
Taihoku	31.8	354	—	—	11 34	-31	—	—
Melbourne	35.7	153	—	—	—	—	e 24.9	28.5
Riverview	35.9	143	—	—	19 11	?	24.9	27.5
Zi-ka-wei	37.9	355	e 7 41	+ 4	—	—	—	—
Colombo	47.9	285	23 15	?L	—	—	26.1	31.9
Kodaikanal	51.2	289	28 27	?L	—	—	(28.4)	—
Mauritius E.	67.2	250	30 3	?L	—	—	(30.0)	33.9
Helwan	97.3	299	25 27	?S	(25 27)	- 2	—	—
Victoria	108.5	40	—	—	—	—	52.3	56.7
Hamburg	110.4	325	—	—	—	—	e 57.8	70.4
Rocca di Papa	111.6	313	—	—	e 28 39	+57	39.5	50.7
De Bilt	113.7	325	—	—	—	—	e 57.5	62.7
Moncalieri	114.4	318	—	—	e 34 5	?SR ₁	62.7	—
Uccle	114.6	324	—	—	—	—	e 55.5	—
Edinburgh	116.5	331	—	—	—	—	64.5	—
Paris	116.5	322	—	—	e 29 27	+65	67.5	—
Eskdalemuir	116.8	331	—	—	—	—	56.5	—
Kew	117.0	327	—	—	—	—	—	56.5
Rio Tinto	127.0	314	79 27	?L	—	—	(79.5)	87.5
Toronto	136.7	27	—	—	—	—	57.9	—
La Paz	153.1	149	21 6	[+66]	i 26 31	?	—	—

Additional readings and notes: Batavia gives $i = +5m.16s.$ and $+7m.27s.$
 Adelaide $i = +22m.9s.$ Riverview $ePR_1 = +15m.48s., MN = +25.3m.$
 Probably the readings of Riverview belong to a different shock, but there is
 no other evidence of it. Helwan $PN = +24m.27s.$ Mauritius $PN =$
 $+27m.39s., MN = +36.4m.$ De Bilt $MN = +62.9m.$ Epicentre $2^{\circ}0S.$
 $120^{\circ}0E.$ Toronto $L = +71.0m.$

May 19d. Readings also at 0h. (Lick), 1h. (San Fernando and near Athens), 3h.
 (near Athens), 4h. (near Algiers), 5h. (Rocca di Papa), 7h. (Besançon),
 8h. (La Paz), 9h. (Helwan), 19h. (Berkeley), 21h. (La Paz).

May 20d. 4h. 36m. 35s. Epicentre $65^{\circ}0S. 39^{\circ}0W.$

A = +328, B = -266, C = -906; D = -629, E = -777;

G = -704, H = +570, K = -423.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Cape Town	46.1	77	23 9	?L	—	—	(23.2)	—
La Paz	52.3	324	9 22	0	16 48	0	25.5	27.4
Helwan	107.6	60	26 25	?S	(26 25)	-41	—	—
Tortosa	108.6	31	—	—	—	—	e 54.4	60.0
Strasbourg	117.7	36	—	—	—	—	58.4	—
Paris	118.5	30	—	—	e 29 25	+47	58.4	—
Kew	118.7	26	—	—	—	—	—	118.4
Uccle	119.0	30	—	—	—	—	e 56.4	—
De Bilt	120.4	30	—	—	e 29 25	+33	e 59.4	60.8

Additional readings: Helwan gives $PN = +25m.25s.$ Strasbourg gives
 another reading at $+62.4m.$ De Bilt $e = +35m.31s., MN = +60.9m.$

1920. May 20d. 7h. 25m. 55s. Epicentre 11° 7S. 166° 3E.

A = -952, B = +232, C = -203; D = +237, E = +972;
G = +197, H = -048, K = -979.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	s.	s.	m. s.	s.	m. s.	s.	m.	m.
Apia	21.5	98	i 4 48	-11	i 8 42	-13	10.1	—
Riverview	26.1	209	i 5 35	-14	i 9 58	-26	e 11.3	12.9
Sydney	26.1	209	5 23	-26	9 53	-31	12.6	15.6
Melbourne	32.3	211	6 53	+2	12 11	-2	15.1	18.0
Christchurch	32.3	170	8 5	?PR ₁	11 35	-38	14.3	18.1
Adelaide	34.2	223	i 6 47	-20	i 11 59	-44	c 14.4	19.4
Honolulu	48.2	47	9 17	+22	i 16 5	+9	23.6	35.9
Perth	50.5	238	9 10	0	11 15	?PR ₁	18.3	—
Manila	52.1	300	e 9 16	-5	—	—	—	—
Tokyo	53.6	332	e 9 27	-3	—	—	—	41.6
Osaka	54.9	329	9 39	+1	17 24	+4	24.7	30.1
Taihoku	57.0	310	9 51	-1	—	—	—	—
Batavia	58.9	270	i 10 5	+1	18 7	-3	e 28.8	—
Zi-ka-wei	60.8	318	e 10 18	0	e 18 36	+3	—	—
Calcutta	83.6	295	12 35	-5	—	—	—	—
Victoria	86.2	39	13 14	+20	23 9	-23	36.0	47.0
Colombo	88.0	278	17 35?	?PR ₁	(24 29)	+37	24.5	24.9
Tucson	E. 90.3	56	23 55	?S	(23 55)	-22	41.0	43.1
Kodaikanal	E. 91.0	280	49 11	?L	—	—	61.5	64.1
Mauritius	E. 102.8	244	26 47	?S	(26 47)	+25	52.1	55.9
	N. 102.8	244	26 11	?S	(26 11)	-11	50.6	130.0
Chicago	109.7	50	19 7	?PR ₁	28 35	+70	52.1	—
Ann Arbor	E. 112.6	49	—	—	—	—	54.9	—
Toronto	115.6	46	e 5 5	?	30 29	+134	36.4	74.1
Ithaca	117.8	47	—	—	—	—	56.2	—
Georgetown	117.9	51	—	—	—	—	56.1	—
Washington	117.9	51	—	—	—	—	e 50.1	—
Cheltenham	118.1	51	—	—	—	—	56.2	—
La Paz	119.2	117	e 19 18	[+28]	30 26	+103	50.2	58.1
Harvard	E. 121.7	47	e 20 49	?PR ₁	e 33 39	?	56.7	—
	N. 121.7	47	e 20 2	?PR ₁	—	—	e 50.8	—
Lemberg	130.9	329	e 19 23	[+2]	e 22 47	?PR ₁	—	22.9
Hamburg	134.1	341	i 19 19	[-9]	—	—	e 63.1	78.1
Helwan	134.5	301	22 5	?PR ₁	—	—	—	—
Edinburgh	135.0	352	19 5	[-25]	—	—	—	—
Eskdalemuir	135.6	352	i 22 1	?PR ₁	—	—	53.1	—
Vienna	135.7	333	i 19 26	[-5]	—	—	e 56.1	84.7
De Bilt	136.8	343	19 47	[+14]	—	—	66.1	87.6
Stonyhurst	137.0	350	23 23	?PR ₁	—	—	36.0	—
Uccle	138.2	343	19 17	[-19]	—	—	—	83.3
Oxford	138.7	349	20 5	[+28]	—	—	62.5	114.4
Kew	138.8	349	—	—	—	—	—	89.1
Strasbourg	139.0	338	e 19 25	[-13]	—	—	e 74.1	80.6
Padova	139.9	332	20 45	[+66]	—	—	—	—
Paris	140.5	345	i 19 28	[-12]	—	—	77.1	90.1
Florence	141.4	331	20 5	[+23]	—	—	—	—
Pompeii	E. 141.8	325	19 25	[-18]	29 25	?	—	—
Moncalieri	142.0	337	19 32	[-11]	33 37	?	47.8	89.6
Rocca di Papa	142.1	329	19 30	[-13]	—	—	e 79.7	87.7
Barcelona	147.2	338	19 36	[-15]	—	—	56.0	91.5
Tortosa	148.3	340	19 49	[-4]	—	—	e 48.1	95.9
Algiers	150.7	332	19 55	[-2]	29 30	?	43.1	110.1
Coimbra	151.1	352	19 25	[-32]	—	—	58.1	90.4
Granada	153.0	342	19 23	[-37]	25 18	?PR ₁	—	—
Rio Tinto	153.2	347	40 5	?SR ₁	—	—	—	97.1
San Fernando	154.4	346	19 47	[-14]	—	—	88.1	117.1

Additional readings: Apia gives also i = +5m.4s. Riverview iP = +5m.59s., PS = +10m.32s., and +10m.48s., MZ = +12.6m., T₀ = 7h.25m.51s. Epicentre 13° 5S. 167° 0E. Melbourne SR₁ = +13m.47s. Adelaide i = +8m.5s., +12m.23s., +12m.53s., and +13m.35s. Osaka MN = +34.6m. Batavia i = +13m.47s. Calcutta PN = +12m.41s. (O-C. = +1s.). Toronto gives also L = +61.8m., eL = +72.0m., L rep. = +130.5, +132.3. Ann Arbor LN = +54.7m. and +55.4m. Georgetown LN = +60.1m. Washington L = +55.1m. La Paz iP = +19m.25s., MN = +59.2m., T₀ = 7h.32m.0s. Helwan PN = +21m.5s. Harvard eN? = +4m.50s., cN = 6m.40s., eE = +37m.45s., eN = +37m.59s., LN = +53.1m. and +55.4m., LE = +61.5m., L(repetition) = +112.4m. Hamburg i = +21m.56s. (iPR₁). MN = +66.1m., MZ = +79.1m. Vienna i = +22m.7s., +23m.5s. De Bilt iPR₁ = +22m.17s., MN = +76.2m., T₀ = 7h.25m.51s. Uccle e₁ = +22m.17s., e₂ = +40m.53s. Strasbourg PR₁ = +22m.28s., MN = +84.8m. Paris PR₁ = +22m.35s. Coimbra P = +21m.40s., PR₁E? = +27m.5s., eLN = +45.8m. San Fernando MN = +114.6m.

May 20d. Readings also at 0h. (Batavia), 2h. (Helwan), 4h. (La Paz), 6h. (Eskdalemuir), 9h. (Mauritius), 14h. (La Paz), 17h. (San Fernando).

May 21d. 19h. 19m. 15s. Epicentre $34^{\circ}0'N$. $131^{\circ}0'E$. (as on 1919 July 2d.).

$$A = -.544, B = +.626, C = +.559.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Nagasaki	1.6	216	0 24	0	(0 40)	- 5	0.7	0.8
Kobe	3.5	83	—	—	1 32	- 5	—	3.2
Osaka	3.8	83	1 5	+ 6	(1 43)	- 1	1.7	3.7
Zi-ka-wei	8.5	254	—	—	—	—	c 4.3	—

No additional readings.

May 21d. Readings also at 0h. (San Fernando), 5h. (La Paz), 8h. (Zi-ka-wei, Calcutta, Manila, and Colombo), 9h. (Uccle and Helwan), 10h. (near Athens), 13h. and 14h. (Point Loma), 16h. (near Tokyo and Mizusawa), 17h. (Toronto), 21h. (San Fernando and Lick).

May 22d. 17h. 4m. 4s. Epicentre $35^{\circ}0'N$. $139^{\circ}5'E$. (as on 1918 June 26d.).

$$A = -.623, B = +.532, C = +.574; \quad D = +.649, E = +.760;$$

$$G = -.436, H = +.372, K = -.819.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	0.7	16	c 0 7	- 4	—	—	c 0.3	0.3
Osaka	3.4	266	1 9	+16	—	—	—	2.6
Mizusawa	4.3	17	1 7	0	—	—	4.9	—
Zi-ka-wei	15.6	261	e 3 47	0	c 7 11	+25	—	—
Manila	26.4	224	e 5 32	-20	—	—	—	—
Honolulu	55.8	87	—	—	—	—	23.9	32.9
Adelaide	70.0	181	—	—	—	—	—	11.9

Additional readings and notes : Tokyo gives MN = +0.4m. Zi-ka-wei P has been corrected by +2m. Manila has been corrected by +7m.

May 22d. 17h. 8m. 50s. Epicentre $23^{\circ}0'S$. $142^{\circ}0'E$.

$$A = -.725, B = +.567, C = -.391; \quad D = +.616, E = +.788;$$

$$D = +.308, E = -.240, G = -.920.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	13.5	145	3 20	0	i 5 57	+1	e 6.7	9.3
Sydney	13.5	145	3 10	-10	(6 4)	+8	6.1	7.7
Melbourne	15.0	171	—	—	—	—	i 7.7	8.2
Victoria, B.C.	110.0	44	—	—	—	—	33.5	40.0
Helwan	118.5	293	60 10	!L	—	—	(60.2)	—
Hamburg	132.8	323	—	—	—	—	e 51.2	—
Chicago	134.9	53	—	—	—	—	e 50.7	—
De Bilt	136.1	321	—	—	—	—	e 44.2	56.9
Uccle	137.1	320	—	—	—	—	e 45.2	—
Paris	139.0	320	—	—	—	—	e 55.2	—
Coimbra	149.7	310	—	—	—	—	e 58.2	—

Additional readings : Riverview gives iS = +6m.30s. Sydney correction of 7min. for P only. Helwan PN = +57m.10s. De Bilt MN = +58.8m. Coimbra e? = 16h. 48m. 30s.

May 22d. Readings also at 3h. (Vienna), 5h. (Taihoku and Manila), 13h. (near Tokyo), 17h. (Toronto, La Paz, and Riverview), 18h. (near Tokyo, Osaka, Kobe, Batavia, Rocca di Papa, and Rio Tinto).

May 23d. 20h. 13m. 6s. Epicentre $3^{\circ}\text{OS. } 149^{\circ}\text{OE.}$ (as on 1913 June 4d.).

A = $-.856$, B = $+.514$, C = $-.052$; D = $+.515$, E = $+.857$;
G = $+.045$, H = $-.027$, K = $-.999$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	30.9	176	e 6 38	+ 1	e 11 51	+1	e 15.3	16.4
Manila	32.8	303	e 8 54	?	—	—	—	—
Taihoku	38.7	318	—	—	13 44	-4	—	—
Batavia	42.2	264	e 7 54	-18	—	—	—	—
Helwan	115.3	302	33 54	?	—	—	—	—

Riverview gives also MN = $+17.8\text{m.}$

May 23d. Readings also at 4h. (near Pompeii), 6h. (Taihoku), 16h. (Stonyhurst), 17h. (La Paz, Melbourne, and Riverview), 20h. (San Fernando).

May 24d. Readings at 2h. (near Tokyo), 6h. (Manila), 9h. (near Tokyo), 11h. (Manila and near Athens), 12h. (Manila and La Paz), 14h. (near Athens), 17h. (Taihoku), 18h. (Dyce), 22h. (San Fernando).

May 25d. 11h. 39m. 55s. Epicentre $33^{\circ}\text{5N. } 46^{\circ}\text{5E.}$ (as on 1917 Nov. 24d.).

A = $+.574$, B = $+.605$, C = $+.552$; D = $+.725$, E = $-.688$;
G = $+.380$, H = $+.401$, K = $-.834$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan	E. 13.4	259	5 53	?S	(5 53)	0	(8.1)	9.7
	N. 13.4	259	6 29	?S	(6 29)	+36	(8.5)	9.1
Pompeii	E. 26.3	295	5 45	- 6	—	—	—	—
Vienna	26.9	312	i 6 3	+ 6	10 44	+ 5	e 15.8	21.3
Rocca di Papa	27.8	297	e 6 5	- 1	—	—	—	18.0
Moncalieri	31.8	304	—	—	e 11 52	-13	18.1	—
Strasbourg	32.4	309	—	—	e 12 26	+12	—	—
Hamburg	32.7	319	—	—	e 12 5	-14	23.1	—
Uccle	35.1	313	—	—	e 12 47	-10	—	—
Paris	35.9	309	—	—	(e 13 5)	- 4	e 13.1	22.1
Eskdalemuir	40.5	318	—	—	—	—	22.1	—

No additional readings.

May 25d. Readings also at 2h. (Lick), 4h. (near Tokyo), 10h. (Manila), 12h. (Strasbourg), 13h. (Manila and Batavia), 14h. and 15h. (Manila), 22h. (La Paz).

1920. May 26d. 12h. 21m. 40s. Epicentre $18^{\circ}\text{OS. } 173^{\circ}\text{OW.}$

(as on 1918 Feb. 3d.).

A = $-.944$, B = $-.116$, C = $-.309$; D = $-.122$, E = $+.993$;
G = $+.307$, H = $+.038$, K = $-.951$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	4.3	17	i 0 57	-10	i 1 17	-41	1.6	—
Riverview	35.7	236	e 7 23	+ 4	e 13 13	+ 7	e 15.8	19.5
Sydney	35.7	236	12 56	?S	(12 56)	-10	17.1	19.3
Melbourne	41.6	233	—	—	—	—	20.1	24.8
Honolulu	42.0	21	e 15 8	?S	(e 15 8)	+33	19.8	25.9
Adelaide	46.0	239	i 8 50	+10	i 15 44	+16	e 22.8	29.2
Manila	72.8	292	e 11 49	+14	—	—	—	—
Berkeley	73.4	40	—	—	—	—	e 9.4	—
Batavia	78.8	274	i 13 28	+76	i 22 27	+17	—	—
Victoria	79.8	31	—	—	23 5	+44	35.4	40.3
Zi-ka-wei	79.9	308	e 12 23	+ 5	—	—	—	—
La Paz	98.4	111	14 10	+ 8	25 38	- 2	47.7	49.7
Chicago	98.6	49	24 20	?S	31 36	?SR ₁	50.6	—
Toronto	104.8	48	29 38	?	e 41 32	?	e 55.9	59.9
Washington	105.7	54	—	—	—	—	e 54.8	—
Ithaca	106.7	50	—	—	—	—	55.0	—
Ottawa	107.7	47	—	—	e 49 20	?	58.3	—

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Harvard	110.6	51	—	—	28 41	+68	57.4	58.5
Eskdalemuir	141.8	9	19 44	[+ 1]	—	—	—	—
Hamburg	144.3	357 e	20 20	[+33]	—	—	e 70.3	85.3
Oxford	145.6	10	19 51	[+ 2]	—	—	—	89.3
De Bilt	145.9	2	19 49	[— 1]	—	—	—	90.0
Kew	146.0	8	—	—	—	—	—	83.3
Uccle	147.1	4	19 53	[+ 2]	—	—	—	86.3
Vienna	148.8	349	19 57	[+ 3]	—	—	—	—
Paris	149.0	6	20 0	[+ 6]	—	—	82.3	88.3
Strasbourg	149.4	358	19 57	[+ 2]	—	—	78.3	—
Moncalieri	153.1	359	20 8	[+ 8]	35 29	?	83.3	—
Coimbra	154.3	28	20 10	[+ 9]	32 13	?	e 78.3	—
Helwan	154.7	303	24 20	?PR ₁	—	—	—	—
Rio Tinto	156.9	28	80 20	?L	—	—	(80.3)	93.3
San Fernando	158.0	29	22 50	?	—	—	—	95.3
Algiers	160.9	9 e	20 28	[+19]	—	—	87.3	—

Additional readings: Riverview gives also PR₁ = +8m.56s., PS = -13m.43s., MN = +20.6m., MZ = +20.3m., T₀ = 12h.21m.5s. Honolulu S = -17m.8s.
Harvard SR₁E = +34m.35s., LE = -68.3m., T₀ = 12h.28m.9s. Eskdalemuir PR₁? = +23m.23s. De Bilt MN = +86.6m. Vienna PE = +20m.1s., i = +20m.4s. Helwan PN = 26m.20s. San Fernando MN = +94.8m.

May 26d. Readings also at 0h. (San Fernando and La Paz), 2h. (near Athens), 19h. (La Paz), 20h. (Stonyhurst), 21h. (La Paz), 22h. (Helwan and Batavia), 23h. (Zi-ka-wei).

May 27d. 5h. 49m. 30s. Epicentre 19°-0N. 109°-0E.

$$A = -.308, B = +.894, C = +.326; \quad D = +.946, E = +.326; \\ G = -.106, H = +.308, K = -.946.$$

This solution is about the best that can be done with the observations as they stand: but there are probably some errors. If Manila S is 1 min. too small and Zi-ka-wei both P and S one min. too large, then T₀ may be about 5h.47m.30s., and the epicentre 10°N. 100°E. would suit all but the European observations. Or reducing T₀ 18 seconds only we get the alternative solution with deep focus, given below.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Hokoto	10.8	63	5 54	?L	—	—	(5.9)	—
Manila	12.3	109	e 3 2	- 1	5 24	- 2	6.2	6.7
Taihoku	13.1	60	6 18	?S	(6 18)	+32	8.9	—
Zi-ka-wei	16.5	40	5 14	+75	e 10 23	+196	—	—
Calcutta	19.6	284	5 12	+36	—	—	10.2	—
Kobe	27.9	51	6 11	+ 4	—	—	e 12.2	—
Nagoya	29.1	51	6 11	- 8	—	—	—	—
Colombo	30.8	250	6 48	+12	—	—	—	9.0
Kodaikanal	31.7	260	13 48	?L	—	—	(13.8)	—
Tokyo	31.8	52	e 7 34	+49	e 11 3	-62	12.8	14.8
Mizusawa	34.2	48	7 2	- 5	13 40	+57	—	—
Adelaide	60.9	152	i 10 0	-18	—	—	—	22.3
Melbourne	66.1	149	(11 36)	+44	—	—	11.6	11.8
Riverview	66.5	142	—	—	(e 21 6)	+82	e 21.1	27.6
Helwan	70.3	295	—	—	20 30	0	—	—
Hamburg	80.0	324	i 16 2	?PR ₁	e 24 14	+111	50.5	—
Pompeii E.	81.0	310	14 18	?PR ₁	—	—	—	—
Rocca di Papa	82.0	312	e 16 0	?PR ₁	—	—	—	33.8
Strasbourg V.	83.0	320	e 16 11	?PR ₁	—	—	—	—
De Bilt	83.2	323	e 16 24	?PR ₁	—	—	—	65.4
Uccle	84.2	322	e 16 18	?PR ₁	25 48	?	—	—
Eskdalemuir	86.3	329	16 57	?PR ₁	23 35	+ 2	29.4	—
Oxford	87.0	324	16 50	?PR ₁	—	—	—	—
Victoria	98.0	31	—	—	—	—	—	31.7
Chicago	117.3	14	20 0	?PR ₁	30 7	+99	—	—
La Paz	176.3	314	17 33	?	—	—	39.7	42.4

Additional readings and notes: Manila gives MN = +6.4m. Zi-ka-wei P has been corrected by +10m. Mizusawa SN = +13m.38s. Adelaide e = +5m.6s., and +6m.36s., i = +13m.30s., +15m.12s., +19m.36s., and +21m.24s. Riverview MN = +21.7m. Helwan PN = +21m.30s. De Bilt MN = +59.1m.

ALTERNATIVE SOLUTION WITH DEEP FOCUS.

May 27d. 5h. 49m. 12s. Epicentre $5^{\circ}0'N$. $110^{\circ}0'E$. (as on 1920 Feb. 26d.).

A = -0.341, B = +0.936, C = +0.087; D = +0.940, E = +0.342;

G = -0.030, H = +0.082, K = -0.996.

The focal depth 0.050 is retained as on Feb. 26d.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Manila	-1.3	14.4	48	e 3 20	+ 6	5 42	- 4	6.5	7.0
Hokoto	-2.1	20.7	26	6 12	-108	6 12	-101	—	—
Taihoku	-2.3	22.9	28	6 36	+108	6 12	-36	9.2	—
Calcutta	-2.9	27.3	312	5 30	- 2	—	—	10.5	—
Zi-ka-wei	-3.0	28.3	21	5 32	- 9	e 10 41	+32	—	—
Colombo	-3.2	30.1	275	7 6	? PR ₁	—	—	—	9.3
Kodaikanal	3.4	32.7	280	14 6	? I.	—	—	14.1	—
Kobe	-3.3	37.7	36	6 29	-35	—	—	e 12.5	—
Nagoya	-3.9	39.1	36	6 29	46	—	—	—	—
Tokyo	4.1	41.1	38	e 7 52	-22	e 11 21	-123	13.2	15.1
Mizusawa	4.3	44.2	36	7 20	-34	13 58	- 7	—	—
Melbourne	-5.1	53.7	145	11 54	? PR ₁	—	—	11.9	12.1
Riverview	5.2	54.9	139	—	—	—	—	e 21.4	27.9
Helwan	-6.1	77.0	300	—	—	20 48	+11	—	—
Pompeii	E. -6.5	90.8	312	14 36	+112	—	—	—	—
Hamburg	-6.5	91.9	325	i 16 20	? PR ₁	e 24 32	+69	50.8	—
Rocca di Papa	-6.5	92.1	313	e 16 18	? PR ₁	—	—	—	34.1
Strasbourg	-6.6	94.3	320	e 16 29	? PR ₁	—	—	—	—
De Bilt	-6.6	95.1	324	e 16 42	? PR ₁	—	—	—	65.7
Uccle	-6.6	95.9	322	e 16 36	? PR ₁	26 6	? SR ₁	—	—
Eskdalemuir	-6.7	98.7	329	17 15	? PR ₁	23 53	-42	29.7	—
Oxford	-6.7	99.0	324	17 8	? PR ₁	—	—	—	—
Victoria	—	109.3	34	—	—	—	—	—	32.0
Chicago	—	130.6	17	20 18	? PR ₁	30 25	?	—	—
La Paz	—	168.4	189	i 17 51	[-143]	—	—	40.0	42.7

May 27d. Readings also at 0h. (San Fernando), 3h. (Stonyhurst), 5h. (near Batavia), 6h. (Riverview), 14h. (La Paz), 15h. (Helwan), 16h. (Stonyhurst), 19h. (Moncalieri), 21h. (near Athens), 22h. (near Kobe).

May 28d. 18h. 25m. 0s. Epicentre $36^{\circ}1'N$. $137^{\circ}3'E$. (as on 1919 Sept. 12d.).

A = -0.594, B = +0.548, C = +0.589.

	Δ	P.	O-C.	L.	ME.	MN.
	°	m. s.	s.	m.	m.	m.
Tokyo	2.0	0 31	0	0.9	1.0	1.0
Osaka	2.1	0 33	0	1.0	—	1.7
Kobe	2.3	0 40	+4	1.1	1.1	1.2

No additional readings.

May 28d. Readings also at 0h. (Helwan and San Fernando), 20h. (Helwan), 21h. (near Athens).

May 29d. 12h. 23m. 0s. Epicentre $25^{\circ}0'N$. $119^{\circ}5'E$. (as on 1918 Dec. 18d.).

A = -0.446, B = +0.789, C = +0.423.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Hokoto	1.5	179	—	—	1 1	+19	1.4	1.5
Taihoku	1.9	89	0 25	- 4	(0 42)	-11	0.7	0.9
Zi-ka-wei	6.4	15	1 39	+ 1	e 2 53	- 2	—	3.8
Manila	10.5	172	2 45	+ 8	—	—	—	—
Hamburg	80.8	325	—	—	—	—	e 44.0	—
De Bilt	84.1	326	—	—	e 22 46	-23	e 47.0	47.6

Zi-ka-wei gives MN = +4.0m., T_0 = 12h. 23m. 8s. De Bilt MN = +47.8m.

May 29d. 19h. 12m. 30s. Epicentre $43^{\circ}0'N$. $15^{\circ}0'E$.

A = +.706, B = +.189, C = +.682; D = +.259, E = -.966;
G = +.659, H = +.176, K = -.731.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		°		m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa		2.1	233	e 0 44	+11	1 40	+42	—	1.9
Pompeii		2.3	189	0 46	+10	1 21	+18	—	2.2
Florence		2.8	286	1 5	+21	(1 5)	-12	—	2.0
Padova		3.3	317	1 53	-61	2 51	-80	—	—
Vienna		5.3	10	i 1 7	-15	—	—	i 2.0	2.6
Moncalieri		5.6	293	1 29	-2	2 51	?L	(2.8)	—
Zurich	E.	6.3	316	1 33	-3	i 2 48	-4	i 3.4	3.7
	N.	6.3	316	1 32	-4	i 2 49	-3	i 3.4	3.7
Strasbourg		7.5	320	e 1 56	-2	—	—	e 4.0	—
Paris		10.4	308	—	—	e 5 53	-73	6.7	7.5
Uccle		10.6	321	e 5 6	?S	(e 5 6)	+21	i 5.7	—
Hamburg		11.0	344	—	—	e 4 54	0	—	7.3
De Bilt		11.2	327	—	—	—	—	e 5.6	6.1
Edinburgh		17.4	324	—	—	—	—	9.5	—
Manila		91.3	69	e 54 30	?L	—	—	(e 54.5)	—

Additional readings:—Padova: Are the readings 1 min. too large? See May 30. Vienna gives also $iZ = +1m.22s.$, $iN = +1m.26s.$, $iE = +1m.32s.$
Hamburg $MZ = +6.9m.$ De Bilt $MN = +6.3m.$ Manila probably records an independent shock.

May 29d. Readings also at 0h. (Helwan and San Fernando), 2h. and 5h. (La Paz), 6h. (Riverview and Osaka), 8h. (Vienna), 12h. (Vienna, Rocca di Papa, and near Mizusawa), 16h. (near La Paz and near Mizusawa), 17h. (Taihoku, Manila, and De Bilt), 21h. (Vieques), 22h. (Port au Prince), 23h. (near Barcelona (2)).

May 30d. 10h. 11m. 10s. Epicentre $43^{\circ}0'N$. $15^{\circ}0'E$. (as on 1920 May 29d.).

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		°		m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa		2.1	233	e 0 36	-3	1 26	+28	—	1.7
Pompeii	E.	2.3	189	0 48	+12	1 30	+27	—	2.0
Florence		2.8	286	0 45	+1	—	—	—	1.8
Padova		3.3	317	1 50	+58	2 47	+76	—	—
Vienna		5.3	10	i 1 25	+3	—	—	i 1.9	2.6
Moncalieri		5.6	293	1 27	0	2 42	-8	—	—
Zurich		6.2	316	e 1 31	-4	i 2 50	+1	e 3.3	3.6
Strasbourg		7.5	320	e 1 44	-10	—	—	e 3.9	—
Paris		10.4	308	—	—	e 4 58	+18	6.6	—
Uccle		10.6	321	—	—	—	—	e 5.4	—
De Bilt		11.2	327	—	—	—	—	e 5.5	6.2

Additional readings: Florence gives its reading as 11h. Padova: Are the readings 1 min. too large? See May 29. Vienna $iPZ = +1m.0s.$ The P entered is given as i. Zurich $ePV = +1m.32s.$ De Bilt $MN = +6.0m.$

May 30d. 20h. 51m. 20s. Epicentre $32^{\circ}0'N$. $110^{\circ}1'W$. (as on 1918 Feb. 12d.).

A = -.291, B = -.794, C = +.533; D = -.939, E = -.344;
G = -.183, H = -.500, K = -.846.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		°		m. s.	s.	m. s.	s.	m.	m.
Tucson	N.	0.6	275	0 6	-3	—	—	0.6	1.2
	E.	0.6	275	0 20	?S	(0 20)	+3	0.6	1.1
Mazatlan		9.6	159	—	—	—	—	—	-1.2
Lick		10.8	302	—	—	—	—	e 4.6	—
Berkeley		11.5	302	—	—	—	—	e 5.0	—
Victoria		19.0	332	7 33	?S	(7 33)	-29	11.5	13.5
Chicago		20.3	56	6 54	?	9 50	+81	10.7	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ann Arbor	23.2	57	—	—	—	—	12.0	—
Toronto	26.6	56	—	—	—	—	13.0	—
Georgetown	27.5	66	—	—	e 12 59	?L	e 15.0	—
Washington	27.5	66	—	—	—	—	e 13.1	—
Cheltenham	27.7	67	13 28	?L	—	—	15.8	15.0
Ithaca	28.4	59	—	—	—	—	e 15.1	—
Ottawa	29.5	53	—	—	e 13 40	?	e 15.0	16.5
Harvard	N. 32.3	60	e 5 40	-71	—	—	e 15.1	16.0
De Bilt	78.6	34	—	—	—	—	e 38.7	46.8
Paris	79.2	38	—	—	e 37 40	?L	40.7	—

Additional readings: Toronto gives $L = +26.8m$. Cheltenham $PE = +13m.56s$. The L and M given are from the E and N component instruments respectively. Ithaca $eN = +12m.53s$. Harvard $ePR_1E = +7m.1s$, $eE = +10m.44s$, and $+11m.34s$, $eLE = +16.1m$.

May 30d. Readings also at 2h. (Manila), 3h. (San Fernando), 6h. (near Mizusawa and Tokyo), 12h. (La Paz), 13h. (Helwan), 14h. (San Fernando), 16h. (De Bilt, Paris, Helwan, Rocca di Papa, and La Paz), 21h. (Tucson).

May 31d. Readings at 6h. (near Pompeii and Rocca di Papa (2)), 7h. (Algiers, Adelaide, and Manila), 9h. (near Adelaide).

June 1d. Readings at 1h. and 7h. (near Manila), 15h. (Lick), 18h. (near La Paz), 22h. (Vienna), 23h. (Lick).

1920. June 2d. 22h. 1m. 40s. Epicentre $21^\circ 0N$. $106^\circ 5W$.
(as on 1919 Sept. 15d.).

$A = -.265$, $B = -.895$, $C = +.358$; $D = -.959$, $E = +.284$;
 $G = -.102$, $H = -.344$, $K = -.934$.

The Georgetown and Harvard readings suggest a second shock about 15min. later.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mazatlan	2.4	2	—	—	—	—	—	2.3
Tacubaya	7.0	102	2 37	+51	5 25	?	5.8	8.7
Tucson	N. 11.9	342	3 25	+27	5 16	-1	5.8	6.3
	E. 11.9	342	4 51	?S	(4 51)	-26	5.3	5.8
Lick	E. 20.8	324	—	—	(e 8 22)	-18	e 8.4	—
Berkeley	E. 21.7	324	e 5 1	0	(e 9 21)	+22	e 9.3	15.1
Chicago	26.2	33	5 14	-36	9 41	-45	12.0	13.8
Ann Arbor	E. 28.7	37	6 26	+11	11 14	+2	14.4	17.0
	N. 28.7	37	6 14	-1	11 8	-4	14.1	16.8
Victoria	30.6	338	8 47	?	11 44	0	15.2	18.1
Washington	30.9	48	7 15	+38	14 40	?L	17.1	—
Georgetown	E. 30.9	48	e 17 6	?L	20 56	?	e 21.8	—
Cheltenham	E. 31.0	48	17 16	?L	—	—	(17.3)	29.0
Toronto	31.9	39	-e 0 16	?	—	—	16.1	18.2
Ithaca	33.0	44	—	—	e 11 50	-34	16.6	—
Ottawa	35.1	39	—	—	e 13 8	+11	e 17.8	—
Northfield	36.3	42	—	—	—	—	e 19.1	—
Harvard	E. 36.5	46	e 19 58	?	20 49	?	22.2	23.7
Honolulu	47.8	280	15 38	?S	(15 38)	-13	21.6	26.1
Edinburgh	79.9	34	—	—	—	—	37.3	47.5
Stonyhurst	81.1	35	—	—	38 20	?	42.0	—
Coimbra	E. 82.5	50	e 12 40	+7	—	—	e 43.8	—
Kew	83.2	39	—	—	—	—	—	49.3
Rio Tinto	84.7	52	—	—	—	—	45.3	51.3
San Fernando	E. 85.4	53	45 20	?L	—	—	(45.3)	—
	N. 85.4	53	53 20	?L	—	—	(53.3)	57.3
De Bilt	E. 85.9	35	—	—	c 23 55	+26	—	53.6

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Paris	86.0	39	e 13 30	+37	—	—	39.3	—
Uccle	86.1	37	—	—	c 23 55	+24	e 38.3	49.8
Hamburg	87.7	31	—	—	—	—	e 41.3	53.3
Tortosa	88.4	46	—	—	—	—	e 36.3	55.9
Strasbourg	89.1	38	—	—	—	—	e 41.3	53.4
Moncalieri	91.0	40	—	—	c 24 41	+17	44.3	—
Rocca di Papa	95.8	40	—	—	—	c 51.0	64.2	—
Helwan	114.9	40	—	—	—	—	47.3	—

Additional readings: Lick gives eLN = +8.3m. Berkeley gives eLN = +9.5m., ME = +12.2m., MN = +16.0m. Ann Arbor, Wiechert PE = +15m.26s., PN = +14m.44s., SE = +19m.26s., SN = +20m.2s., LN = +22.4m. The B readings for P. S. and L have been diminished by 9min., and these Wiechert readings require correction also. But see note on p. 99. Georgetown gives eLN = +21.9m., LE = +23.0m., LN = +22.7m. Cheltenham gives PN = +17m.17s. Toronto gives eL = +17.6m. Harvard gives eLE = +22.9m., $T_0 = 22h.12m.35s.$ Eskdalemuir $\Delta 80^{\circ}0$ Az. 34° gives L = 22h.38m. Coimbra—the readings have been increased by +4min. gives also eN? = +1m.20s., eLN = +33.3m. San Fernando gives PN = +20h.55m.0s. De Bilt gives eSR₁ = +29m.22s., MN = +47.8m. Strasbourg gives MN = +47.0m.

June 2d. 23h. 55m. 24s. Epicentre $23^{\circ}0N. 135^{\circ}0E.$

A = - .651, B = + .651, C = + .391; D = + .707, E = + .707;
G = - .276, H = + .276, K = - .920.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagasaki	10.7	336	e 2 43	+ 3	—	—	6.9	—
Taihoku	12.4	282	3 0	- 5	(5 4)	-25	5.1	—
Zi-ka-wei	14.6	307	e 4 44	+70	e 6 4	-18	—	—
Manila	15.7	240	—	—	—	—	e 8.6	—
Hamburg	90.0	331	—	—	—	—	e 46.6	—
De Bilt	93.1	332	—	—	—	—	e 48.6	53.0
Edinburgh	93.5	338	—	—	—	—	49.6	—
Eskdalemuir	94.0	338	—	—	—	—	51.6	—
Uccle	94.4	331	—	—	—	—	e 47.6	52.8
Strasbourg	94.4	329	—	—	—	—	e 49.6	—
Stonyhurst	94.9	336	—	—	—	—	53.1	—
Kew	95.8	335	—	—	—	—	—	56.6
Rocca di Papa	96.1	321	—	—	—	—	e 51.9	62.2
Paris	96.6	330	—	—	—	—	e 52.6	52.6
Moncalieri	96.8	326	—	—	—	—	e 50.8	—
Tortosa	103.5	327	—	—	—	—	e 51.6	56.0

No additional readings.

June 2d. Readings also at 1h. (Osaka and Kobe), 8h. (near Osaka and Kobe), 13h. (La Paz), 18h. (near Tokyo).

June 3d. Readings at 1h. (Lick and near La Paz), 15h. (San Fernando), 16h. (Zi-ka-wei), 18h. (near Tokyo and near Mizusawa), 20h. (near Oaxaca and Tacubaya and near Mizusawa).

June 4d. 4h. 44m. 57s. (I))
4h. 49m. 7s. (II)) Epicentre $44^{\circ}6N. 13^{\circ}3E.$ (as on 1918 Nov. 6d.).

A = + .693, B = + .164, C = + .702; D = + .230, E = - .973;
G = + .683, H = + .162, K = - .712.

	Δ	Az.	P.	O-C.	S.	O-C.	M.
	°	°	m. s.	s.	m. s.	s.	m.
I Padova	1.3	308	0 21	+ 1	0 43	+ 7	—
II	1.3	308	0 24	+ 4	0 45	+ 9	—
I Rocca di Papa	2.9	189	0 45	0	—	—	2.8
II	2.9	189	1 21	?S	(1 21)	+ 1	2.3
I Moncalieri	4.0	276	—	—	c 1 39	-11	—
II	4.0	276	—	—	c 1 25	-25	—
II Zurich	4.3	312	e 1 10	+ 3	1 53	- 5	—
I Strasbourg	5.5	318	2 33	?S	(2 33)	+ 1	—
II	5.5	318	e 2 29	?S	(2 29)	- 2	—

No additional readings.

June 4d. 15h. 29m. 15s. (I) Epicentre $32^{\circ}2'N. 110^{\circ}1'W.$ (as on 1920 May 30d.).
15h. 36m. 40s. (II)

$$A = -.291, B = -.794, C = +.533; \quad D = -.939, E = +.344; \\ G = -.183, H = -.500, K = -.846.$$

It seems clear that there was more than one shock near Tucson, but the interpretation of the material is very doubtful.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
I Tucson	E.	0.6	275	—	—	—	—	0.3	0.6
I	N.	0.6	275	0 10	+ 1	—	—	0.9	1.4
II	E.	0.6	275	—	—	—	—	0.1	0.7
II	N.	0.6	275	—	—	—	—	0.8	1.4
I Berkeley		11.5	302	0 5	?	(4 54)	-13	e 4.9	—
I Victoria		19.0	332	4 55	+26	—	—	9.8	13.8
I Chicago		20.2	55	4 25	-18	7 19	-68	8.3	—
II		20.2	55	5 22	+39	7 45	-42	—	—
I Ann Arbor		23.2	57	—	—	11 9	?SR ₁	—	—
II		23.2	57	—	—	10 38	?SR ₁	14.0	—
I Toronto		26.6	56	—	—	—	—	2.0	—
II		26.6	56	—	—	—	—	0.6	—
I Washington		27.5	66	—	—	e 9 22	-88	—	—
I Ithaca		28.4	59	—	—	e 11 45	+39	—	—
I Northfield		31.5	57	—	—	13 45	?SR ₁	—	—
I Harvard		32.3	60	—	—	—	—	e 16.6	19.6
II		32.3	60	—	—	—	—	—	18.4
I La Paz		63.2	134	13 1	?PR ₁	—	—	—	—

Additional readings:—Ann Arbor: The readings entered as S (I) and S (II) are given as PE and SE with the Bosch instrument, which also gives PN = +11m.3s. ?SR₁ for (I) and SN = +10m.26s. ?SR₁ for (II). With the Wiechert instrument we have further PN = +10m.45s. (=SR₁ for I?) and LN for (II) = +14.0m. Mazatlan ($\Delta = 9^{\circ}6'$) gives P = 15h.25m.42s., M = 15h.23m.44s., suggesting some error, or another shock.

June 4d. Readings also at 0h. (La Paz), 2h. (La Paz and Riverview), 10h. (Mizusawa and Cheltenham), 12h. (Manila), 13h. (Berkeley), 18h. and 23h. (Batavia).

1920. June 5d. 4h. 21m. 30s. Epicentre $24^{\circ}0'N. 120^{\circ}0'E.$
(as on 1919 Sept. 8d.).

$$A = -.457, B = +.792, C = +.407; \quad D = +.866, E = +.500; \\ G = -.204, H = +.352, K = -.914.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Hokoto		0.6	222	0 58	+49	1 7	+50	1.6	2.1
Taihoku		1.8	53	0 30	+ 2	—	—	—	—
Zi-ka-wei		7.3	10	e 1 51	0	e 3 25	+ 7	—	—
Manila		9.5	172	i 2 15	- 8	—	—	i 4.0	4.6
Nagasaki		12.3	42	2 50	-13	(5 23)	- 3	5.4	6.4
Jinsen		14.6	21	3 24	-10	6 9	-13	8.2	—
Kobe		17.0	47	3 53	-12	5 31	?PR ₁	7.4	16.5
Osaka		17.2	48	3 37	-30	—	—	7.2	8.7
Nagoya		18.5	49	13 59	?	—	—	—	—
Tokyo		20.7	51	4 26	-23	6 15	?PR ₁	7.8	10.4
Mizusawa	E.	23.4	45	4 54	-27	9 0	-33	—	—
	N.	23.4	45	4 55	-26	9 25	- 8	—	—
Sapporo		26.0	37	7 54	+126	12 15	+113	13.2	—
Calcutta	E.	29.1	273	6 18	- 1	11 30	+11	16.9	—
	N.	29.1	273	6 6	-13	11 30	+11	17.0	—
Ootomari		29.1	33	5 55	-24	(10 54)	-25	10.9	14.3
Batavia		32.8	205	i 6 43	-12	14 59	+158	e 21.6	—
Dehra Dun		37.7	289	6 0	-96	—	—	—	—
Simla		38.4	290	7 30	-11	13 36	- 8	22.1	22.9
Colombo		42.1	252	7 36	-36	14 6	-30	17.3	22.0
Kodaikanal		42.8	260	9 48	?PR ₁	—	—	25.4	31.1
Bombay		44.1	273	8 34	+ 7	—	—	—	29.8

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Perth	56.1	184	9 40	-7	15 42	?	22.3	—
Adelaide	61.6	163	i 10 12	-11	i 18 36	-7 e	24.8	43.6
Riverview	65.0	152	e 10 34	-11	i 19 10	-15 e	26.0	31.6
Sydney	65.0	152	—	—	19 30	+5	29.8	38.5
Melbourne	66.1	160	10 6	-46	19 18	-20	30.7	43.5
Honolulu	74.6	75	i 11 54	+8	i 21 6	-15 e	37.1	50.1
Lemberg	75.6	320	e 10 44	-69	i 20 29	-64 e	42.3	47.3
Apia	76.6	111	11 42	-17	21 19	-25	36.5	40.5
Helwan	E. 77.2	297	12 24	+22	—	—	—	61.1
	N. 77.2	297	10 48	-74	—	—	—	49.6
Sitka	E. 77.6	33	11 54	-11	21 48	-8	38.0	—
Athens	80.2	309	e 12 0	-20	22 23	-2 e	28.5	49.5
Vienna	80.8	320	i 12 23	-1	i 22 39	+6 e	37.9	46.4
Hamburg	81.9	328	i 12 29	-1	i 22 48	+3 e	38.5	46.2
Christchurch	83.1	146	12 30	-7	22 54	-4	37.7	43.7
Padova	84.9	320	12 56	+9	23 17	-1	40.1	48.7
De Bilt	85.2	326	12 48	-1	22 56	-25 e	36.5	49.4
Pompeli	E. 85.4	314	11 48	-62	22 15	-68	34.8	67.5
Dyce	85.6	334	12 50	-1	23 24	-2	35.9	—
Strasbourg	85.7	322	i 12 46	-6	23 10	-17	40.5	49.3
Zurich	85.9	322	e 12 46	-7	i 23 26	-3	—	—
Florence	86.1	319	13 10	+16	23 40	+9	41.5	48.8
Rocca di Papa N.	86.1	314	12 52	-2	23 43	+12	47.3	53.6
Uccle	86.3	327	i 12 50	-5	23 13	-20	35.5	48.9
Milan	86.5	320	13 28	+32	24 0	+24	44.5	56.5
Edinburgh	86.8	332	12 55	-3	23 35	-4	37.5	48.0
Eskdalemuir	87.2	332	12 55	-5	23 39	-4	38.1	44.7
Besançon	87.4	322	13 9	+8	23 38	-7	39.5	—
Moncalieri	87.6	319	12 58	-5	23 36	-12	35.1	50.6
Stonyhurst	87.8	330	12 48	-16	23 18	-32	42.2	51.5
Kew	88.2	329	22 30	?S	(22 30)	-84	—	53.5
Victoria	88.2	37	11 43	-83	22 32	-82	41.7	61.9
	Z. 88.2	37	11 48	-78	22 16	-98	—	—
Paris	88.4	326	i 12 59	-8	e 23 20	-36	40.5	48.5
Oxford	88.6	329	12 57	-11	23 30	-29	33.7	52.5
Puy de Dôme	90.0	322	17 10	?PR ₁	—	—	—	—
Barcelona	93.0	320	e 13 12	-20	23 50	-55 e	41.7	53.4
Tortosa	94.3	320	13 15	-25	24 3	-56	41.1	56.4
Berkeley	95.0	45	e 13 20	-23	e 23 55	-71 e	39.4	—
Algiers	95.1	315	13 44	0	23 56	-71	41.5	55.5
Lick	E. 95.7	45	e 13 25	-22	e 24 0	-73	—	—
	N. 95.7	45	e 13 27	-20	e 24 15	-58	—	—
Granada	99.1	319	e 14 12	+6	i 25 15	-32	—	—
Coimbra	E. 99.8	323	13 52	-18	24 32	-82	43.5	56.7
	N. 99.8	323	—	—	24 24	-90	43.0	55.9
San Fernando	101.0	320	17 50	?PR ₁	24 54	-71	51.5	60.7
Tucson	105.4	43	17 58	?PR ₁	24 57	-109	49.6	54.5
Chicago	109.4	22	16 0	?	23 50	-213	33.3	—
Toronto	110.0	14	14 48	-9	25 48	-100	i 62.0	63.4
Ann Arbor	E. 110.2	18	17 54	?PR ₁	28 18	+48	58.6	60.0
	N. 110.2	18	18 12	?PR ₁	28 6	+36	60.1	72.2
Northfield	110.8	9	—	—	e 25 30	-125 e	52.5	—
Ithaca	111.8	13	17 55	?PR ₁	—	—	50.8	—
Cape Town	112.2	240	29 58	?S	(29 58)	+110	—	64.5
Harvard	E. 113.1	9	i 19 15	?PR ₁	29 0	+65	e 50.6	69.5
	N. 113.1	9	i 19 21	?PR ₁	30 15	+140	e 51.2	—
Washington	115.1	12	e 18 30	[-8]	—	—	e 50.5	—
Georgetown	E. 115.1	12	e 19 18	?PR ₁	26 40	-91	56.8	76.8
	N. 115.1	12	e 19 18	?PR ₁	26 43	-88	67.0	75.8
Cheltenham	E. 115.3	12	19 47	?PR ₁	26 40	-92	56.1	76.9
	N. 115.3	12	19 28	?PR ₁	26 40	-92	55.2	78.1
Vieques	137.5	6	21 27	?PR ₁	—	—	64.7	78.9
La Paz	169.3	47	i 20 14	[0]	i 31 59	?	70.9	82.2

Additional readings and notes: Manila gives MN = +4.2m. Kobe MN = +10.0m. Osaka MN = +8.8m. Tokyo MN = +12.9m. Sapporo : Readings corrected by -9h. Adelaide i = +12m.18s., e = +14m.18s. and +15m.12s., i = +21m.6s., +22m.6s., and +22m.48s. Riverview iP = +10m.38s., iPR₁ = +13m.18s., i = +19m.18s., PS = +19m.32s., MN = +31.0m., MZ = +36.5m., T₀ = 4h.21m.26s., epicentre 28° 0'N. 133° 0'E. Sydney SR₁ = +23m.48s., SR₂? = +26m.42s. Melbourne PR₂ = +14m.12s., SR₁ = +23m.36s., SR₂ = +26m.30s. Lemberg e = +37m.34s. Apia readings at +12m.33s. and at +32m.30s. Athens MN = +46.4m., T₀ = 4h.21m.5s. Vienna iPEN = +12m.24s., i = +33m.16s., MN = +49.5m.

Notes continued on next page.

Hamburg $SR_1 = +28m.35s.$, $SR_2 = +32m.49s.$, $MZ = +53.0m.$, $T_0 = 4h.21m.38s.$, Padova $PR_1 = +23m.17s.$, De Bilt $PN = +12m.49s.$, $iE = +23m.22s.$, $iN = +23m.25s.$, $MN = +48.9m.$, $T_0 = 4h.22m.8s.$, Epicentre $24^\circ 0'N, 121^\circ 7'E.$, Dyce $LN = +35.8m.$, Strasbourg $MZ = +58.0m.$, $T_0 = 4h.21m.49s.$, Uccle $PR_1 = +16m.19s.$, $SR_1 = +29m.29s.$, $T_0 = 4h.21m.55s.$, Edinburgh $SR_1 = +29m.30s.$, Eskdalemuir $PR_1 = +16m.24s.$, $T_0 = 4h.22m.34s.$, Moncalieri $MN = +54.1m.$, Stonyhurst $P = +16m.30s.$ (? PR_1), Victoria $eL = +70.7m.$, $+101.3m.$, and $+134.6m.$, $T_0 = 4h.20m.21s.$, Paris $PR_1 = +16m.34s.$, $T_0 = 4h.22m.6s.$, Barcelona $iE = +17m.16s.$, $iN = +17m.37s.$, $iE = +26m.40s.$, $iN = +26m.52s.$, $T_0 = 4h.22m.2s.$, Berkeley $ePNV = +13m.18s.$, $eLN = +38.0m.$, $eLV = +43.9m.$, $T_0 = 4h.22m.8s.$, Algiers $PR_1 = +17m.29s.$, $L = +47.5m.$, $MN = +62.5m.$, $T_0 = 4h.23m.0s.$, Lick $ePV = +13m.24s.$, $T_0 = 4h.22m.16s.$, Granada $iP = +14m.18s.$, $T_0 = 4h.22m.35s.$, Coimbra $PSE = +23m.48s.$, $i = +24m.56s.$, $T_0 = 4h.22m.47s.$, Chicago $L = +46.5m.$, $+60.5m.$, $+65.5m.$, and $+83.5m.$, Toronto $L = +35.9m.$, and $+39.9m.$, $iL = +67.2m.$ and $+74.4m.$, $eL = +86.1m.$, $T_0 = 4h.23m.12s.$, Ottawa $P? = +18m.30s.$, $S? = +28m.30s.$, $L = +46.5m.$, record fogged. Ann Arbor LEN (Wiechert) $+59.8m.$, Cape Town $S = +33m.16s.$, Harvard $ePE? = +17m.38s.$, $SR_1N? = +35m.2s.$, $T_0 = 4h.21m.26s.$, Washington $L = +68.5m.$, Georgetown $eLE = +35.8m.$, Vieques $LE = +77.6m.$, La Paz $PR_1 = +24m.49s.$, $PR_2 = +26m.56s.$, $SR_1 = +38m.59s.$, $T_0 = 4h.27m.49s.$

June 5d. Readings also at 0h. (Helwan), 1h. (near Mizusawa), 4h. (Taihoku (4)), 5h. (Taihoku (3), Hokoto (2), and Zi-ka-wei (2)), 6h. (La Paz (2), Taihoku (7), Mizusawa, Osaka, Manila, and Batavia), 7h. (Taihoku (4)), 8h. (Taihoku (4)), 9h. (Taihoku (2)), 10h. (Taihoku (4) and Mizusawa), 12h. (Taihoku (3) and Kodaikanal), 13h. (Taihoku), 14h. (Taihoku (4)), 15h. (Taihoku (3) and Zi-ka-wei), 16h. (Taihoku (3), Hokoto, and Batavia), 17h. (Taihoku, Paris, Hamburg, Eskdalemuir, Rocca di Papa, Stonyhurst, Edinburgh, De Bilt, Kew, Helwan, Strasbourg, and Uccle), 18h. (Kodaikanal (2) and Taihoku (2)), 19h. (Taihoku (2)), 20h. (Taihoku (4), Zi-ka-wei, La Paz, and Nagasaki), 21h. (De Bilt, Paris, Rocca di Papa, Taihoku, Kew, Stonyhurst, Eskdalemuir, Strasbourg, Vienna, San Fernando, Uccle, Hamburg, Helwan, Tortosa, and Edinburgh), 22h. (Hokoto and La Paz), 23h. (La Paz).

June 6d. Readings at 1h. (2) and 3h. (Taihoku), 5h. (near Ootomari, Osaka, Manila, and near Cape Town), 6h. (Kobe, Helwan, and Taihoku), 7h. (Nagasaki), 8h. (La Paz), 9h. (La Paz and Taihoku), 11h. (Zi-ka-wei, Manila, Taihoku, Riverview, and Melbourne), 13h. (Vienna and Rocca di Papa), 15h. (near Osaka), 16h. (Taihoku), 18h. (Tokyo), 19h. (Taihoku (2), Manila, and Zi-ka-wei), 20h. (Strasbourg, San Fernando, Uccle, De Bilt, Taihoku (2), and Zi-ka-wei), 21h. (Taihoku), 22h. (Manila, Zi-ka-wei, near Taihoku (2), and near Hokoto), 23h. (De Bilt, Paris, Taihoku (2), and Uccle.)

June 7d. 22h. 0m. 20s. Epicentre $21^\circ 0'S, 67^\circ 0'W.$ (as on 1919 Aug. 9d.).

$A = +.365$, $B = -.860$, $C = -.358$; $D = -.920$, $E = -.391$;
 $G = -.140$, $H = +.330$, $K = -.934$.

	Δ	Az.	P.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m.	m.
La Paz	4.6	345	i 1 11	0	2.3	2.5
Paris	93.2	38	—	—	49.7	—
Moncalieri	94.3	43	e 46 7	? L	53.9	—
Uccle	95.1	38	—	—	—	56.7
De Bilt	96.1	36	—	—	e 53.7	54.7
Strasbourg	96.1	40	—	—	56.7	—
Rocca di Papa	96.5	49	e 51 46	? L	e 55.1	—
Hamburg	99.4	36	—	—	e 16.7	e 54.7
Taihoku	171.2	299	—	—	—	e 81.5

Additional readings: De Bilt $MN = +55.9m.$

June 7d. Readings also at 3h. (Taihoku and near Tacubaya and Oaxaca), 4h. (Victoria), 7h. (Taihoku), 9h. (Athens, La Paz, and near Tucson), 10h. (Taihoku and Batavia), 11h., 13h., and 14h. (Taihoku), 15h. (La Paz), 16h. (Manila and Coimbra), 17h. (near Athens), 19h., 20h., and 23h. (2) (Taihoku).

June 8d. 16h. 12m. 50s. (I) }
 17h. 17m. 10s. (II) } Epicentre $44^{\circ}5'N$. $11^{\circ}5'E$. (as on 1919 Sept. 20d.).
 18h. 29m. 35s. (III) }

A = +.699, B = +.142, C = +.701.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
I Florence	0.7	0 14	- 3	—	—	—	0.4
II	0.7	0 7	- 4	—	—	—	—
III	0.7	0 12	+ 1	—	—	—	—
I Padova	0.9	0 33	+19	0 48	+23	—	1.2
II	0.9	0 50	?	1 18	?	—	2.2
III	0.9	0 35	+21	1 3	+38	—	1.4
I Rocca di Papa	2.8	i 0 47	+ 3	—	—	—	2.2
II	2.8	e 1 9	?S	(e 1 9)	- 8	—	2.0
III	2.8	e 0 46	+ 2	1 17	0	—	1.6
I Zurich	3.5	e 1 7	+12	1 58	-21	—	—
II	3.5	e 1 11	+16	i 1 57	+20	—	—
III Pompeii	E. 4.4	1 10	+ 2	2 20	+19	—	—
III	4.4	2 15	?S	(2 15)	+14	(2.8)	—
I Strasbourg	4.8	e 1 24	+10	—	—	—	—
II	4.8	e 1 28	+14	(e 2 28)	+17	(e 2.7)	—
III Vienna	5.0	e 2 9	?S	(2 9)	- 8	i 3.1	—
II	5.0	e 3 30	?L	—	—	(3.5)	4.3
III	5.0	e 2 19	?S	(2 19)	+ 2	i 3.2	3.9
I De Bilt	8.9	—	—	—	—	e 6.2	e 6.6
I Hamburg	9.1	—	—	—	—	e 5.2	7.8

Several stations give other alternative readings not very different from those given in this table. Strasbourg gives its readings for III as ePZ, ePN, and ePE respectively. Other shocks felt in this neighbourhood are: 4h. 21m. 55s. Rocca di Papa, 13h. 31m. 57s. Rocca di Papa, 16h. 35m. 15s. Florence, 17h. 44m. 0s. Zurich and Strasbourg, 17h. 59m. 39s. Rocca di Papa, 18h. 5m. 42s. Florence, 19h. 37m. 6s. Rocca di Papa. [These times are as read at the station, not reduced to T_0 . They accord closely with a period of 22.8min.]

June 8d. Readings also at 2h., 3h. (2), 4h., and 5h. (Taihoku), 8h. (Helwan and La Paz), 9h. and 11h. (Taihoku), 12h. (near Nagasaki), 13h. (Paris and near Tacubaya), 14h. (Kodaikanal), 16h. (La Paz), 18h. and 23h. (2) (Taihoku).

June 9d. 3h. 9m. 37s. Epicentre $54^{\circ}8'N$. $143^{\circ}7'E$.

A = -.465, B = +.341, C = +.817; D = +.592, E = +.806;

G = -.659, H = +.484, K = -.576.

	Δ	Az.	P.	O-C.	S.	O-C.	M.
	°	°	m. s.	s.	m. s.	s.	m.
Mizusawa	E. 15.8	187	3 49	0	6 50	0	—
Tokyo	19.3	190	3 48	-45	—	—	—
Nagoya	20.2	196	4 38	- 5	—	—	—
Osaka	20.9	199	4 52	0	—	—	10.9
Manila	43.9	211	e 15 0	?S	(e 15 0)	- 1	—
De Bilt	67.8	332	—	—	e 20 20	+20	—
Paris	71.4	334	e 12 2	+36	—	—	—
Florence	73.5	325	—	—	—	—	17.4
Rocca di Papa	74.8	323	e 11 49	+ 1	—	—	12.6
Helwan	77.5	305	19 23	?S	(19 23)	-152	—
La Paz	134.5	44	e 20 20	[+51]	—	—	—

Additional readings: Mizusawa gives E = +4m.8s. Florence gives P? = 2h.54m.52s. (an error somewhere apparently).

1920. June 9d. 11h. 30m. 35s. Epicentre 3°-5S. 129°-0E.

(See also 1919 Aug. 29d.).

A = -·623, B = +·776, C = -·061; D = +·777, E = +·629;

G = +·038, H = -·047, K = -·998.

The residuals indicate a displacement of the epicentre 2·0 to the East, to 3°-5S. 131°-0E. They also suggest a diminution of T_0 by 6sec. or 7sec. to 11h. 30m. 29s., say, which would strengthen the antiecentric indications of high focus; but the epicentric stations do not allow of this.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	19·8	336	e 4 42	- 3	i 7 55	-24	i 8·8	8·9
Batavia	22·2	262	5 5	- 2	e 9 11	+ 2	e 24·4	—
Taihoku	29·4	346	6 15	- 7	—	—	12·2	—
Perth	31·0	201	6 33	- 5	13 5	+74	19·2	—
Adelaide	32·7	165	i 6 19	-35	i 11 25	-54	e 14·8	18·1
Zi-ka-wei	35·4	350	e 7 9	- 8	e 12 49	-12	—	—
Nagasaki	36·3	1	e 7 22	- 2	(e 13 11)	- 3	e 13·2	—
Riverview	36·7	148	e 6 58	-30	i 12 42	-38	e 16·1	21·1
Sydney	36·7	148	e 6 25	-63	12 55	-25	18·7	19·7
Melbourne	37·3	159	6 43	-49	12 31	-57	18·2	21·4
Kobe	38·6	9	7 22	-21	(13 39)	- 7	13·6	23·8
Osaka	38·7	10	7 43	- 1	13 58	+10	16·6	18·6
Nagoya	39·4	10	7 30	-20	—	—	—	—
Tokyo	40·4	13	8 1	+ 3	(e 14 0)	-13	e 14·0	16·0
Jinsen	41·1	357	7 50	-14	13 34	-48	—	—
Mito	41·3	14	8 5	0	14 16	- 9	—	—
Mizusawa	43·8	14	8 17	- 7	14 50	- 9	—	—
	N.	43·8	8 22	- 2	14 57	- 2	—	—
Calcutta	47·5	307	8 49	- 2	(15 55)	- 7	15·9	—
Colombo	50·2	281	9 49	+41	16 49	+28	20·9	22·4
Kodaikanal	53·1	285	13 49	?	—	—	25·0	31·2
Christchurch	55·6	142	9 55	+12	17 25	- 4	25·7	35·4
Bombay	59·6	294	9 25	-44	—	—	—	—
Honolulu	75·5	67	11 49	- 3	i 21 31	- 1	e 37·1	46·7
Helwan	98·3	300	17 55	?PR ₁	—	—	—	62·1
	N.	98·3	20 37	?PR ₁	—	—	—	60·9
Lemberg	102·3	320	e 18 19	?PR ₁	e 26 19	+ 1	—	27·8
Victoria	104·3	40	21 44	?	27 30	+54	34·9	56·0
Cape Town	104·8	233	25 44	?S	(25 44)	-56	—	—
Berkeley	106·8	51	—	—	e 25 18	-101	—	—
Vienna	107·5	321	e 17 54	?	29 10	+124	e 53·9	63·4
Hamburg	109·6	326	e 18 49	?PR ₁	e 29 47	+143	e 54·9	57·4
Padova	111·2	317	11 25	?	19 41	?PR ₁	—	20·6
Rocca di Papa	111·7	312	e 18 20	?PR ₁	e 26 30	-73	e 57·0	59·0
Strasbourg	112·8	320	e 19 13	?PR ₁	e 29 16	+84	e 57·4	70·0
De Bilt	112·9	325	—	—	—	—	e 54·4	60·0
Uccle	113·9	324	e 19 13	?PR ₁	—	—	e 48·4	60·4
Dyce	114·0	333	—	—	—	—	56·4	—
Moncalieri	114·2	318	e 18 34	?	30 26	+142	41·7	—
Edinburgh	115·2	330	e 20 5	?PR ₁	—	—	51·4	58·9
Eskdalemuir	115·6	331	20 6	?PR ₁	—	—	52·4	59·4
Paris	115·9	322	e 15 15	-10	e 30 16	+119	58·4	61·4
Stonyhurst	116·0	329	31 7	?S	(31 7)	+169	—	—
Kew	116·2	327	37 25	?SR ₁	—	—	—	80·4
Oxford	116·5	327	20 0	?PR ₁	—	—	—	—
Barcelona	119·3	315	e 20 31	?PR ₁	—	—	e 54·6	64·3
Algiers	120·3	310	e 20 19	?PR ₁	e 26 18	-153	e 59·4	77·4
Tortosa	120·6	315	20 40	?PR ₁	35 21	?SR ₁	50·6	80·8
Coimbra	126·9	319	20 55	?PR ₁	32 30	?	50·4	—
Rio Tinto	127·0	315	23 25	?PR ₁	—	—	—	92·4
San Fernando	127·3	312	21 25	?PR ₁	—	—	—	93·9
Chicago	129·7	34	20 30	?PR ₁	27 25	-154	43·4	—
Toronto	132·7	27	—	—	—	—	e 75·7	85·0
Ottawa	132·9	21	e 22 34	?PR ₁	—	—	—	—
Harvard	137·2	20	e 19 40	[+ 6]	—	—	e 64·1	—
	N.	137·2	20	e 19 52	[+18]	—	e 64·1	—
Georgetown	137·4	29	e 22 25	?PR ₁	—	—	—	—
Washington	137·4	29	e 19 35	[0]	—	—	—	—
La Paz	153·8	140	20 6	[- 5]	34 6	?	73·1	88·8

For Notes see next page.

NOTES TO JUNE 9d. 11h. 30m. 35s.

Additional readings: Manila gives also MN = +11.7m., T_0 = 11h.31m.17s.
 Batavia P_2 ? = +6m.15s., S_2 ? = +10m.8s. Adelaide i = +6m.37s., e = +9m.19s., i = +12m.13s., +12m.43s., and +13m.31s. Riverview i = +7m.9s., PR_1 = +8m.41s., PS = +12m.52s., MN = +23.4m., T_0 = 11h.30m.15s. Melbourne SR_1 = +14m.49s. Kobe MN = +13.8m.
 Osaka MN = +19.6m., T_0 = 11h.30m.24s. Tokyo eS = +9m.55s. (? PR_1), MN = +22.2m. Calcutta LE = +16.0m. Vienna i = +19m.12s., SE = +28m.59s., SR_1 ? = +34m.41s. Hamburg MZ = +70.4m. Strasbourg MN = +63.6m. De Bilt e PR_1 = +19m.36s., eLN = +53.4m., MN = -59.8m., T_0 = 11h.30m.20s. Epicentre 4.78. 130.3E. Coimbra LN = +61.4m. Chicago L = +51.4m., -59.4m., and +62.9m. Toronto eL = +79.8m. Harvard eN = +22m.46s., eE = +22m.49s., eN = +23m.54s., LE = +64.8m., LN = +97.4m. La Paz L = +68.3m., T_0 = 11h.33m.13s.

June 9d. Readings also at 0h. (San Fernando), 1h. (La Paz and near Osaka), 5h. and 6h. (Taihoku), 7h. (Apia), 8h. (Taihoku), 11h. (Toronto), 12h. (Taihoku), 13h. (Toronto, Zi-ka-wei, Hokoto, and near Taihoku), 15h. (near Rocca di Papa), 16h. (near Osaka), 19h. (Riverview and Melbourne), 20h. (Helwan and De Bilt), 21h. (La Paz and near Taihoku), 22h. (La Paz), 23h. (Helwan).

June 10d. 2h. 29m. 30s. Epicentre $11^\circ 0'N$, $127^\circ 0'E$.

A = -.591, B = +.784, C = +.191; D = +.799, E = +.602;
 G = -.115, H = +.152, K = -.982.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	6.9	303	e 1 45	0	e 3 1	-6	3.4	5.4
Taihoku	14.9	341	3 47	+9	(6 50)	+20	6.8	—
Zi-ka-wei	20.8	347	4 54	+3	e 8 51	+11	—	—
Osaka	24.9	17	5 31	-6	(9 47)	-14	9.8	12.0
Batavia	26.4	230	i 6 32	+40	9 54	-36	—	12.7
Tokyo	27.2	23	e 6 51	? PR_1	—	—	—	—
Kodaikanal	48.7	275	—	—	—	—	27.4	29.2
Melbourne	51.6	162	e 16 30	?S	(e 16 30)	-9	—	33.5
Honolulu	72.2	71	20 36	?S	(20 36)	-16	34.0	51.5
Helwan	89.4	301	23 30	?S	(23 30)	-37	—	—
Hamburg	96.4	328	—	—	e 24 30	-50	e 52.5	62.5
De Bilt	99.6	329	—	—	e 24 42	-70	e 49.5	62.5
	N.	99.6	329	—	—	—	e 48.5	56.1
Rocca di Papa	100.0	318	e 18 36	? PR_1	—	—	e 56.1	—
Strasbourg	100.0	324	—	—	e 46 30	?L	e 55.5	—
Uccle	100.3	327	—	—	—	—	e 50.5	—
Edinburgh	101.4	335	—	—	24 55	-74	—	65.0
Eskdalemuir	101.8	335	27 23	?S	(27 23)	+70	48.5	—
Moncalieri	101.8	321	e 2 26	?	—	—	57.6	—
Paris	102.8	327	e 14 7	-17	—	—	52.5	59.5
La Paz	164.3	112	20 19	[+8]	25 56	? PR_1	—	—

Additional readings: Manila gives also MN = +4.6m. Helwan PE = +22m.30s. Hamburg MN = +65.5m. Rocca di Papa PR_1 = +27m.6s.
 La Paz i = +31m.41s., T_0 = 2h.42m.43s.

June 10d. 17h. 53m. 43s. Epicentre $46^\circ 5'N$, $151^\circ 5'E$.

A = -.605, B = +.328, C = +.725; D = +.477, E = +.879;
 G = -.638, H = +.346, K = -.688.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	6.0	274	1 37	+5	(2 40)	-4	2.7	3.9
Sapporo	8.0	248	2 45	+44	5 19	?L	6.7	—
Mizusawa	10.6	229	2 30	-8	4 29	-16	—	—
	N.	10.6	229	2 32	-6	4 31	-14	—
Osaka	16.9	232	4 14	+10	—	—	—	12.3
Zi-ka-wei	27.7	247	e 6 6	+1	—	—	—	—
Manila	40.0	230	e 7 17	-38	—	—	—	—
Hamburg	74.7	337	—	—	—	—	e 38.3	40.3
Edinburgh	75.4	346	—	—	—	—	30.3	—
Eskdalemuir	76.0	346	—	—	21 17	-20	—	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
De Bilt	E.	77.3	340	e 17 56	?PR ₂	e 21 40	-12	e 35.3	47.0
	N.	77.3	340	—	—	—	—	e 41.3	42.6
Stonyhurst		77.3	346	44 5	?L	51 5	?	60.0	—
Vienna		77.5	331	—	—	—	—	e 42.3	50.9
Uccle		78.6	340	—	—	—	—	e 41.3	44.3
Kew		79.1	345	—	—	—	—	—	46.3
Strasbourg		79.9	337	—	—	—	—	e 40.3	—
Paris		80.9	341	—	—	—	—	e 43.3	45.3
Moncalieri		83.1	336	—	—	e 21 47	-71	45.7	—
Rocca di Papa		84.5	330	e 2 53	?	—	—	e 41.9	—
Helwan		86.5	311	34 17	?	—	—	—	—
Tortosa		88.9	340	23 20	?S	(23 20)	-42	e 46.3	53.4
Rio Tinto		93.5	344	53 17	?L	—	—	(53.3)	58.3
San Fernando		94.7	343	41 47	?L	—	—	(41.8)	57.8

Additional readings: Osaka gives also MN = +11.3m. Hamburg MN = +42.3m. De Bilt eSR₁ = -26m.39s., T₀ = 17h.54m.47s. Paris MN = +48.3m. Moncalieri S₁ = +34m.34s. Helwan PN = +29m.17s. Sapporo readings are given as June 11d. 0h. and have been corrected by -7h. instead of -9h., the usual longitude correction for Japan.

June 10d. Readings also at 0h. (Taihoku), 1h. (Moncalieri), 2h. (Batavia), 3h. and 4h. (Taihoku), 5h. (Helwan and Manila), 8h. (2), 9h. (2), and 18h. (Taihoku), 20h. (Taihoku and near Mizusawa and Tokyo), 21h. (Taihoku and La Paz), 23h. (Tokyo (2) and Taihoku).

June 11d. Readings at 1h. (San Fernando), 10h. (Batavia), 11h. (Taihoku), 14h. (San Fernando), 17h. and 18h. (Taihoku).

June 12d. 1h. 20m. 0s. Epicentre 37° 0'N. 20° 5'E. (as on 1919 June 3d.).

A = +.748, B = +.280, C = +.602.

		Δ	P.	O-C.	S.	O-C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Zante		1.6	0 0	-24	—	—	—	—
Athens		2.8	0 39	-5	—	—	1.1	1.3
Pompeii	E.	5.9	1 37	+6	3 32	?L	(3.5)	—
Rocca di Papa		7.6	e 1 52	-3	—	—	—	5.0
Helwan		11.6	7 0	?L	—	—	(7.0)	—
Vienna		11.6	e 5 37	?S	(e 5 37)	+28	e 6.4	7.4
Moncalieri		12.4	—	—	e 6 43	?L	8.0	—
Lemberg		13.1	—	—	—	—	e 6.5	7.9
Strasbourg		14.9	—	—	—	—	e 8.6	—
Paris		17.6	—	—	—	—	9.0	—
Uccle		18.0	—	—	—	—	e 10.0	—
Hamburg		18.1	—	—	—	—	e 10.0	—
De Bilt		18.5	—	—	e 7 56	+5	e 10.3	10.8

Additional readings: Athens gives MN = +1.4m. Helwan PN = +14m.0s. De Bilt MN = +11.2m.

June 12d. 15h. 26m. 10s. Epicentre 23° 8'S. 172° 5'E.

A = -.907, B = +.119, C = -.404; D = +.130, E = +.992; G = +.400, H = -.053, K = -.915.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview		21.2	237	e 4 55	0	e 8 48	0	e 9.9	12.1
Sydney		21.2	237	-1 28	?	(8 50)	+2	8.8	12.1
Melbourne		27.3	233	—	—	—	—	11.6	16.8
Adelaide		31.4	241	—	—	e 11 44	-14	i 16.0	19.4
Honolulu		53.5	35	21 32	?SR ₁	—	—	e 26.6	32.8
Manila		63.4	302	e 9 50	-44	—	—	—	—
Batavia		65.3	274	10 46	-1	—	—	—	20.4
Helwan		145.0	289	82 50	?L	—	—	(82.8)	—
Hamburg	Z.	147.5	341	e 19 50	{ -2}	—	—	—	—
Vienna		149.2	328	e 19 46	{ -8}	—	—	—	21.1
De Bilt		150.1	344	—	—	—	—	e 73.8	80.7
Rocca di Papa		155.5	322	e 20 2	{0}	e 22 50	?PR ₁	—	24.6

Additional readings: Riverview gives also eP = +5m.8s., PS = +9m.9s., MN = -12.3m., T₀ 15h.26m.14s. Helwan PN = +80m.50s. Vienna i = +20m.1s. Rocca di Papa ePN = +20m.10s., iE = +20m.11s.

June 12d. Readings also at 4h. (near Athens), 5h. (Zante), 11h. (Manila), 14h. (San Fernando), 16h. and 17h. (Taihoku), 20h. (Taihoku, Harvard, near La Paz, and near Mizusawa), 21h. (near Mizusawa), 23h. (Manila and Perth).

June 13d. Readings at 0h. (La Paz), 1h. and 4h. (near Tacubaya), 7h. (near La Paz), 9h. (Apia), 12h. (San Fernando), 15h. (near Tokyo and Barcelona), 18h. (Moncalieri), 19h. (Taihoku).

June 14d. 13h. 6m. 14s. Epicentre $40^{\circ}0'N$. $76^{\circ}0'E$. (as on 1919 July 24d.).

	Δ	Az.	P.	O-C.	S.	O-C.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.
Vienna	42.5	301	e 8 16	+ 1	—	—
Rocca di Papa	46.8	293	8 46	0	—	—
Moncalieri	49.1	300	—	—	e 15 51	-16
Paris	51.2	308	e 9 30	+16	—	—
Edinburgh	52.2	316	—	—	16 46	0

June 14d. 13h. 8m. 10s. Epicentre $40^{\circ}0'N$. $76^{\circ}0'E$. (as on 1919 July 24d.).

A = +.185, B = +.743, C = +.643; D = +.970, E = -.242;

G = +.155, H = +.624, K = -.766.

Direct comparison with 1919 July 24 shows close accordance for some of the following observations: and a discordance of about two minutes for others, collected under the preceding assumed shock.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Simla	9.0	174	2 2	-14	—	—	e 3.7	4.4
Calcutta	20.4	146	7 38	?S	(7 38)	-54	10.6	—
Helwan	37.6	268	17 50	?L	—	—	(17.8)	—
Vienna	42.5	301	e 6 20	-115	—	—	e 21.4	28.5
Hamburg	45.4	310	—	—	e 16 50	+90	—	30.3
Rocca di Papa	46.8	293	6 50	-116	e 16 50	+72	—	38.9
Strasbourg	48.0	302	e 8 50	-4	—	—	24.8	—
De Bilt	48.6	310	9 5	+ 7	—	—	e 24.8	30.2
Moncalieri	49.1	300	—	—	e 13 55	-132	—	—
Uccle	49.4	309	e 9 14	+11	—	—	e 22.8	—
Paris	51.2	308	e 7 34	-100	—	—	27.8	32.8
Edinburgh	52.2	316	—	—	14 50	-116	—	34.8
Stonyhurst	52.4	313	32 2	?L	—	—	(32.0)	—
Eskdalemuir	52.4	315	—	—	—	—	27.8	—

Additional readings: Calcutta gives also PN = +7m.32s. De Bilt ePE = +8m.46s., MN = +26.5m. Rocca di Papa iE = +7m.13s., probably referring to preceding shock. Hamburg MN = +25.1m.

June 14d. Readings also at 0h. (Taihoku (2)), 7h. (La Paz), 8h. (Helwan), 14h. (near Mizusawa), 15h. (Stonyhurst and Vienna), 19h. (La Paz).

June 15d. 3h. 3m. 0s. Epicentre $24^{\circ}5'N$. $143^{\circ}5'E$. (as on 1919 Sept. 11d.).

A = -.732, B = +.541, C = +.415; D = +.595, E = +.804;

G = -.333, H = +.247, K = -.910.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	11.6	345	2 41	-12	—	—	—	18.2
Osaka	12.3	327	3 1	-2	—	—	—	13.1
Taihoku	20.0	279	4 58	+17	—	—	8.7	—
Zi-ka-wei	20.6	294	e 4 56	+ 8	—	—	—	—
Manila	23.4	249	e 5 0	-21	—	—	—	—
Honolulu	53.6	80	—	—	e 17 36	+32	27.1	36.6
Vienna	93.3	328	13 28	-6	—	—	e 52.0	61.0
Edinburgh	94.7	342	—	—	24 0	-63	—	—
Helwan	95.1	306	62 0	?	—	—	—	—
De Bilt	E. 95.2	344	—	—	e 24 12	-56	e 52.0	59.3
Uccle	96.6	344	—	—	—	—	e 50.0	—
Paris	98.7	335	—	—	—	—	e 54.0	65.0
Moncalieri	99.6	330	—	—	—	—	e 53.3	—
Rocca di Papa	99.7	324	—	—	—	—	e 62.2	—

No additional readings.

June 15d. 14h. 2m. 15s. Epicentre $43^{\circ}0'N$. $15^{\circ}0'E$. (as on 1920 May 30d.).

$$A = +.706, B = +.189, C = +.682.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	2.1	233	0 23	-10	0 59	+ 1	—	1.2
Pompeii E.	2.3	192	1 6	?S	(1 6)	+ 3	—	—
Padova	3.3	317	0 45	- 7	1 26	- 5	—	1.7
Vienna	5.3	10	e 1 37	+15	—	—	i 2.6	3.1
Zurich E.	6.2	316	e 1 41	+ 6	i 2 11	-38	—	—
Strasbourg	7.5	320	e 2 21	+27	e 3 22	- 2	e 3.8	—

Zurich gives $eN = +1m.39s$.

Strasbourg $eN = +2m.50s$.

June 15d. Readings also at 0h. (Lick, Vienna, La Paz, and near Apia), 1h. (San Fernando and near Algiers), 2h. (La Paz and Helwan), 5h. (La Paz, Manila, and Batavia), 10h. (San Fernando and near Tokyo), 11h. (near Taihoku), 16h. (Athens), 19h. (Rio Tinto).

June 16d. 16h. 47m. 25s. Epicentre $24^{\circ}0'N$. $120^{\circ}0'E$. (as on June 5d.).

$$A = -.457, B = +.792, C = +.407; \quad D = +.866, E = +.500; \\ G = -.204, H = +.352, K = +.914.$$

	Δ	Az.	P.	O-C.	L.	M.
	°	°	m. s.	s.	m.	m.
Taihoku	1.8	53	0 22	- 6	0.6	0.8
Zi-ka-wei	7.3	10	e 2 0	+ 9	—	—
Manila	9.5	172	—	—	e 5.2	—
De Bilt	85.2	326	—	—	e 46.6	56.3
Strasbourg	85.7	322	—	—	e 55.6	—
Uccle	86.3	327	—	—	e 42.6	—
Edinburgh	86.8	332	—	—	48.6	—
Moncalieri	87.6	319	—	—	53.1	—
Paris	88.4	326	—	—	e 55.6	—

De Bilt gives $MN = +56.0m$.

Jan. 16d. Readings also at 0h. (San Fernando, Helwan, and De Bilt), 12h. (Stonyhurst and near Lick and Berkeley), 13h. (Manila), 14h. (Moncalieri and near Taihoku (2)), 20h. (Harvard).

June 17d. Readings at 0h. (San Fernando), 4h. (La Paz (2)), 5h. and 6h. (Taihoku), 12h. (La Paz and near Nagasaki), 14h. (San Fernando), 17h. (Taihoku and near Berkeley), 18h. (Helwan), 19h. (Rio Tinto).

June 18d. 10h. 8m. 3s. Epicentre $33^{\circ}0'N$. $121^{\circ}5'W$.

$$A = -.438, B = -.715, C = +.545; \quad D = -.853, E = +.522; \\ G = -.284, H = -.464, K = -.839.$$

The Georgetown and Harvard observations may refer to another shock some 13min. later.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Lick N.	4.3	358	e 1 2	- 5	—	—	—	—
Berkeley Z.	4.9	352	e 1 17	+ 1	e 2 17	+ 3	e 2.6	—
Tucson E.	9.0	92	3 26	?	4 4	+ 1	—	5.4
Victoria	15.4	356	6 20	?S	(6 20)	-21	9.3	11.2
Ann Arbor	31.0	62	16 57	?L	—	—	(17.0)	—
Toronto	34.3	61	—	—	—	—	29.4	—
Washington	36.1	68	—	—	—	—	e 16.5	—
Georgetown E.	36.1	68	e 17 40	?L	20 46	?	e 21.6	—
Ithaca	36.3	62	—	—	—	—	e 17.4	—
Ottawa	37.0	59	—	—	—	—	e 17.4	—
Harvard E.	40.3	62	e 17 39	?SR ₁	—	—	e 21.0	23.4
N.	40.3	62	e 17 46	?SR ₁	20 22	?L	e 21.0	21.3
De Bilt E.	83.0	30	—	—	—	—	e 45.0	49.1

Additional readings: Berkeley gives $eSN = +2m.20s$. Tucson $SN = +3m.58s$. Georgetown $ePN = +17m.46s$. De Bilt $eLN = +42.0m$.

June 18d. Readings also at 0h. (San Fernando), 1h. and 4h. (La Paz), 5h. (San Fernando), 6h. (Manila), 9h. (Harvard (2)), 10h. (Harvard), 12h. (San Fernando), 13h. (La Paz and Nagasaki), 16h. (Manila), 18h. (near Tokyo), 23h. (near Tokyo and Taihoku).

June 19d. Readings at 0h. (San Fernando), 1h. (Tokyo), 8h. (Apia and La Paz), 9h. (Taihoku), 10h. (Batavia and near Rocca di Papa), 13h. (Manila), 16h. and 23h. (Taihoku).

June 20d. 12h. 14m. 56s. Epicentre $43^{\circ}5'N$, $17^{\circ}0'E$.

A = +.694, B = +.212, C = +.688; D = +.292, E = -.956;
G = +.658, H = +.201, K = -.725.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Pompeii	E.	3.3	220	1 0	+ 8	1 50	+19	(1.8)	1.9
Rocca di Papa		3.6	243	i 1 4	+ 8	1 52	+13	(1.9)	2.7
Padova		4.1	299	—	—	3 1	?L	(3.0)	4.9
Vienna		4.8	355	i 2 3	?S	(i 2 3)	- 8	e 3.0	3.8
Zurich	E.	7.1	307	e 1 53	+ 5	i 3 22	+ 9	—	—
	N.	7.1	307	i 1 54	+ 6	i 3 23	+10	—	—
Athens		7.5	135	i 2 7	+13	i 3 44	+20	—	4.4
Lemberg		8.0	35	—	—	—	—	e 4.4	5.0
Strasbourg	Z.	8.2	312	2 8	+ 4	e 3 51	- 9	—	—
Puy de Dôme		10.1	287	4 4	?L	—	—	(4.1)	—
Barcelona		11.1	264	i 1 59	-47	3 57	-60	—	—
Hamburg		11.1	338	i 2 57	+11	—	—	(i 5.3)	—
Uccle		11.3	315	e 4 50	?S	(e 4 50)	-12	—	—
Paris		11.3	303	i 4 35	?S	(i 4 35)	-27	—	—
De Bilt		11.7	321	2 54	- 1	5 14	+ 2	—	—
Algiers		12.5	242	i 2 3	-63	—	—	3.6	3.7
Tortosa		12.5	263	2 14	-52	4 0	-92	4.1	4.1
Helwan		17.8	136	7 4	?S	(7 4)	-32	—	—
San Fernando		19.0	256	5 57	+88	—	—	—	—

Additional readings and notes: Rocca di Papa gives also MN = +2.0m. Zurich gives its S's two minutes early—earlier than the P's. Hamburg gives L as iPE, also L? = +22.1m., T_0 = 12h.14m.58s. Helwan PN = +5m.4s.

June 20d. Readings also at 0h. (Riverview, Batavia, and La Paz), 1h. (Manila, De Bilt, Helwan, Paris, and San Fernando), 2h. (Manila), 3h. (Taihoku), 7h. (Florence), 8h. (Riverview), 9h. (De Bilt, Paris, and Manila), 10h. (Rocca di Papa), 12h. (La Paz), 13h. (Apia, Coimbra, and near Mizusawa).

June 21d. 7h. 21m. 35s. Epicentre $43^{\circ}0'N$, $15^{\circ}0'E$. (as on June 15d.).

A = +.706, B = +.189, C = +.682.

(Clearly not from the same focus as June 20d. 12h.).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa		2.1	233	i 0 40	+ 7	0 52	- 6	—	0.9
Pompeii	E.	2.3	192	0 47	+11	1 1	- 2	—	1.4
Padova		3.3	317	2 4	+72	3 6	+95	—	3.9
Vienna		5.3	10	e 2 37	?L	—	—	(e 2.6)	4.8
Moncalieri		5.6	293	e 1 13	-14	—	—	—	3.7
Zurich	E.	6.2	316	e 2 10	+35	i 2 37	-12	—	—
Hamburg		11.0	345	—	—	—	—	e 7.4	—

Zurich gives eN = +2m.8s.

June 21d. Readings also at 9h. (near Rocca di Papa), 11h. (La Paz and Taihoku), 12h. (Granada), 13h. (Taihoku), 14h. (Chicago, Washington, Harvard, and near Tacubaya), 18h. (Taihoku), 19h. (Manila and Taihoku), 20h. (Helwan), 21h. (Lick).

June 22d. 2h. 48m. 6s. Epicentre $33^{\circ}0'N$, $121^{\circ}5'W$. (as on June 18d.).

A = -438, B = -715, C = +545; D = -853, E = +522;
G = -284, H = -464, K = -839.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Lick	E.	4.3	358	e 1 10	+ 3	—	—	e 2.2	2.6
	N.	4.3	358	e 1 15	+ 8	—	—	e 2.1	2.6
Berkeley	E.	4.9	352	e 1 13	- 3	e 2 15	+ 1	2.6	4.3
	N.	4.9	352	e 1 15	- 1	e 2 17	+ 3	2.6	4.4
Tucson	N.	9.0	92	3 18	?	—	—	3.8	4.1
Victoria		15.4	356	—	—	—	—	—	11.1
Chicago		28.1	62	8 58	?PR ₁	11 26	+ 25	12.3	—
Toronto		34.3	61	—	—	—	—	16.8	—
Georgetown	E.	36.1	68	e 16 54	?SR ₁	22 38	?	—	—
Washington		36.1	68	e 15 4	?SR ₁	17 10	?L	18.1	—
Cheltenham	N.	36.2	68	17 8	?L	—	—	18.0	18.3
Ithaca		36.3	62	—	—	—	—	e 17.4	—
Ottawa		37.0	59	—	—	—	—	e 17.8	—

Additional readings and notes: Point Loma ($\Delta = 3^{\circ}.1$) gives 2h.67m., probably a misprint for 2h.47s. Lick e?E = +1m.28s. Berkeley e?E = +1m.36s.
Tucson PE = +3m.21s., ME = +4.3m.

June 22d. 8h. 9m. 51s. Epicentre $34^{\circ}5'N$, $138^{\circ}0'E$. (as on 1919 Feb. 5d.).

A = -613, B = +551, C = +566.

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo		1.9	0 33	+ 4	0 53	0	1.1	1.1
Osaka		2.2	—	—	0 56	- 4	1.5	2.2
Mizusawa	E.	5.2	1 21	+ 1	2 23	+ 1	—	—
	N.	5.2	1 22	+ 2	2 24	+ 2	—	—
Taihoku		17.1	2 17	?	—	—	2.5	—

June 22d. Readings also at 2h. (Harvard), 10h. (near Tokyo), 12h. (Stonyhurst), 13h. (La Paz), 15h. (Point Loma), 18h. (Taihoku), 22h. (Ann Arbor).

June 23d. Readings at 13h. (Apia), 16h. (La Paz), 17h. (Helwan and Manila), 19h. (near Algiers and near Mizusawa), 21h. (La Paz and San Fernando), 22h. (Lick).

June 24d. 5h. 48m. 45s. Epicentre $64^{\circ}1'N$, $27^{\circ}5'W$. (as on 1920 May 14d.).

A = +388, B = -202, C = +900; D = -462, E = -887;
G = +798, H = -415, K = -437.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Edinburgh		14.5	113	3 27	- 6	—	—	—	8.7
Oxford		18.4	120	4 18	- 4	—	—	8.9	12.5
De Bilt		20.6	110	e 4 47	- 1	e 8 32	- 4	9.8	12.0
Uccle		21.3	113	e 4 51	- 6	e 8 51	+ 1	—	—
Hamburg		21.6	101	e 5 6	+ 6	—	—	e 11.2	15.2
Paris		22.2	119	e 5 6	- 1	—	—	11.2	12.2
Strasbourg		24.4	112	e 4 47	-45	—	—	e 14.4	—
Coimbra		26.4	146	5 52	0	10 9	-21	12.6	—
Tortosa		28.4	131	c 10 15	?S	(e 10 15)	-51	e 13.2	18.2
Rocca di Papa		32.0	114	—	—	—	—	e 18.8	19.4
Helwan		49.9	104	34 15	?L	—	—	(34.2)	—

Additional readings: De Bilt gives MN = +11.4m. Coimbra PE = +6m.5s.
Helwan PE = +38m.15s.

June 24d. Readings also at 0h. (near Kobe), 3h. (near Tokyo), 5h. (La Paz), 6h. (near Athens), 9h. (Batavia, La Paz, and Manila), 11h. and 16h. (La Paz), 18h. (Paris and De Bilt), 19h. (San Fernando).

June 25d. 10h. 23m. 45s. Epicentre $42^{\circ}0'N$. $141^{\circ}0'E$. (as on 1919 July 21d.).

$$A = -\cdot577, B = +\cdot467, C = +\cdot669.$$

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mizusawa	E.	2.9	0 50	+ 5	1 26	+ 6	—	—
	N.	2.9	0 51	+ 6	1 28	+ 8	—	—
Ootomari		4.8	1 9	— 5	—	—	2.0	—
Tokyo		6.4	e 1 40	+ 2	—	—	e 3.0	4.6
La Paz		144.3	i 19 41	[- 6]	20 51	?	21.2	—

Tokyo gives MN = +4.7m.

June 25d. 10h. 29m. 38s. Epicentre $64^{\circ}1'N$. $27^{\circ}5'W$. (as on June 24d.).

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Eskdalemuir		14.6	112	—	—	—	—	5.4	—
Oxford		18.4	120	—	—	7 25	-24	10.4	—
De Bilt		20.6	110	—	—	—	—	e 11.4	12.9
Uccle		21.3	113	—	—	—	—	e 10.4	—
Paris		22.2	119	e 5 7	0	e 9 9	0	11.4	12.4
Strasbourg		24.4	112	—	—	—	—	15.4	—

Additional readings: De Bilt gives MN = +12.6m. Paris cSE = +9m.4s.

June 25d. 18h. 21m. 45s. Epicentre $64^{\circ}1'N$. $27^{\circ}5'W$. (as at 10h.).

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Stonyhurst		16.4	118	—	—	—	—	8.0	—
Oxford		18.4	120	—	—	7 40	- 9	9.5	—
De Bilt		20.6	110	e 4 55	+ 7	e 8 23	-13	e 9.8	13.0
Uccle		21.3	113	e 5 3	+ 6	e 8 39	-11	e 9.8	—
Hamburg		21.6	101	e 5 15	+15	—	—	e 14.2	—
Paris		22.2	119	e 5 15	+ 8	i 9 3	- 6	11.2	13.2
Strasbourg		24.4	112	e 5 35	+ 3	e 9 15	-37	e 14.2	—
Moncalieri		27.3	117	—	—	—	—	14.4	—
Tortosa		28.4	131	6 17	+ 5	—	—	14.2	19.7
Rocca di Papa		32.0	114	—	—	—	—	e 19.0	22.0

De Bilt MN = +11.8m. Moncalieri gives e = 18h.2m.8s., S? = 18h.20m.58s.

June 25d. 21h. 17m. 10s. Epicentre $43^{\circ}0'N$. $15^{\circ}0'E$. (as on June 21d.).

$$A = +\cdot706, B = +\cdot189, C = +\cdot682.$$

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Rocca di Papa		2.1	e 0 11	-22	—	—	—	2.5
Pompeii	E.	2.3	0 0	-36	1 5	+ 2	—	—
Padova		3.3	2 7	?S	(2 7)	+36	—	4.8
Vienna	N.	5.3	e 1 22	0	e 2 26	+ 1	e 2.8	3.3
Moncalieri		5.6	—	—	e 4 27	?	6.9	—
Strasbourg		7.5	—	—	—	—	e 4.2	—
Paris		10.4	—	—	—	—	8.8	—
Hamburg		11.0	—	—	—	—	e 6.8	—
De Bilt		11.2	—	—	—	—	e 6.9	—

Additional readings: Vienna gives also ePZ = +1m.19s. Strasbourg e₂N = +4m.57s.

June 25d. Readings also at 2h. (Lick), 9h. (La Paz), 11h. (Uccle, Paris, and Rocca di Papa), 14h. (near Mizusawa), 16h. (Stonyhurst), 20h. (Helwan), 22h. (near Berkeley), 23h. (Apia, Manila, and Paris).

June 26d. 7h. 30m. 34s. Epicentre $18^{\circ}5S, 10^{\circ}0W$.

A = +.934, B = -.165, C = -.317; D = -.174, E = -.985;

G = -.312, H = +.055, K = -.948.

The T_0 is taken from Coimbra which, however, appears badly out in the table.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz	55.2	265	9 41	- 1	—	—	25.4	29.0
Coimbra	53.7	1	8 39	-84	15 26	-161	e 28.6	—
Helwan	62.6	41	19 26	?8	(19 26)	+30	29.4	—
Rocca di Papa	63.8	20	e 10 44	+ 7	—	—	e 35.2	37.2
Moncalieri	65.5	14	—	—	e 18 55	-36	30.7	—
Paris	68.2	10	e 11 3	- 2	—	—	32.4	36.4
Strasbourg	68.9	13	e 11 10	0	—	—	—	34.4
Uccle	70.4	11	e 11 16	- 3	—	—	e 33.4	—
De Bilt	71.8	11	—	—	e 24 52	?SR ₁	—	42.5

Additional readings: La Paz gives $i = +10m.1s.$, $T_0 = 7h.31m.2s.$ Rocca di Papa $i = +10m.47s.$ De Bilt MN = +41.7m.

June 26d. Readings also at 0h. (Rocca di Papa), 3h. (De Bilt, Paris, Washington, and Chicago), 13h. (Helwan, Batavia, Manila, Riverview, and near Mizusawa), 14h. (Batavia).

June 27d. Readings at 0h. (Manila), 4h. (Taihoku (2)), 7h. and 8h. (La Paz), 11h. (Eskdalemuir, Rocca di Papa, Paris, Edinburgh, Uccle, and De Bilt), 16h. (Batavia), 17h. (Tacubaya), 18h. (near Oaxaca), 20h. (La Paz).

June 28d. Readings at 0h. (Manila), 3h. (La Paz), 4h. (De Bilt, Uccle, and Helwan), 9h. (near Lick), 10h. (Manila), 16h. (near La Paz), 20h. (San Fernando), 21h. (La Paz), 23h. (Helwan and near Tokyo).

June 29d. Readings at 0h. and 4h. (La Paz), 16h. (Coimbra), 19h. (La Paz, Rocca di Papa, Padova, and Rio Tinto), 21h. (San Fernando).

June 30d. 4h. 15m. 20s. (I) Epicentre $53^{\circ}5N, 159^{\circ}0W$. (as on 1919 July 31d.).
4h. 24m. 20s. (II)

A = -.555, B = -.213, C = +.804; D = -.358, E = +.934;

G = -.751, H = -.288, K = -.595.

The hypothesis of two separate shocks from the same epicentre has no direct support, as no station records a double phase. But it seems impossible to reconcile all the readings with a single shock. Similar difficulties were found on 1919 July 31.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
II Victoria	22.8	89	—	—	—	—	—	13.6
II Chicago	47.4	76	8 53	+ 3	15 40	- 6	21.2	—
II Toronto	50.7	67	—	—	—	—	e 32.1	34.3
I Hamburg	72.5	7	11 33	0	—	—	e 40.7	48.7
I De Bilt	E. 73.6	10	—	—	e 21 19	+10	e 40.7	43.1
I	N. 73.6	10	—	—	—	—	e 38.7	42.4
I Uccle	74.7	11	—	—	e 21 30	+ 8	e 38.7	40.7
II Paris	76.5	12	—	—	—	—	39.7	—
I Rocca di Papa	N. 84.4	6	e 12 35	- 9	22 54	-18	e 56.2	—
I Pompeii	E. 85.5	5	14 8	+77	24 8	+43	—	—
I Helwan	96.1	351	—	—	24 40	-37	—	—
II La Paz	103.7	99	25 38	?8	(25 38)	-52	41.3	42.4

Additional readings: Chicago L = +24.7m. and = +28.7m. Hamburg I gives also MN = -50.7m. Uccle SR₁ = +26m.48s. Paris gives simply 5h.4m. to 20m. Rocca di Papa. The L may belong to (II). Helwan gives also +23m.40s. La Paz L and M may belong to (I).

June 30d. Readings also at 3h. (Manila), 5h. (Toronto), 8h. (La Paz), 9h. (La Paz and Helwan), 12h. (La Paz), 13h. (Helwan), 15h. (Manila), 16h. (Manila and Lick), 18h. (Rio Tinto), 19h. (Stonyhurst), 22h. (La Paz).

The merest glance at these collated records suggests that there are many cases of mistakes, which could probably be corrected if the records were again scrutinised with the figures given as a guide. But it must be admitted that this suggestion is not always confirmed by experience. A striking example occurs on 1920 June 2d. 22h. The residuals for Ann Arbor shown on p. 84 are satisfactorily small, but (as mentioned in the Notes on p. 85) this result is only attained by subtracting 9 minutes from the published records, which are as follows (for two machines, of which B is given in the text):—

	P.		S.		L.		M.	
	h.	m.	h.	m.	h.	m.	h.	m.
B - EW	22	17.1	22	21.9	22	25.1	22	17.7
B - NS	22	16.9	22	21.8	22	24.8	22	17.5
W - EW	22	17.1	22	21.1	—	—	—	—
W - NS	22	16.4	22	21.7	22	24.1	—	—

It will be seen that the M readings precede the L, thus independently suggesting a correction to P, S, L of about 9min. The correction was thus made confidently; but at the same time inquiry was made at Ann Arbor for justification. The following letter from the Director, however, shows that *no justification is forthcoming*, according to the ordinary standard of procedure. The readings are a complete puzzle.

Detroit Observatory,
University of Michigan,
Ann Arbor,
September 24, 1924.

My dear Professor Turner,

We have re-examined the Ann Arbor seismograms of June 2, 1920, and find nothing to change in the record as published. We have examined the clock correction, and find that it has been applied correctly. The seismographic record, nine minutes earlier than the published times, is a straight line without any indication of the approaching disturbance.

The seismograms are difficult of interpretation, owing to their peculiarities. The note No. 384 was written by an Assistant, Mr. Carpenter, who is no longer with us. The times for PR₁, PR₂, and SR₁, which he obtained, have not been preserved. Dr. Rufus, who now has this work in hand, thinks that these times cannot be determined with certainty. I am sorry that we cannot furnish them.

I am,

Yours very sincerely,

W. J. HUSSEY.

TABLE.

De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.
1	15	28	13	51	553	991	438	101	855	1565	710
2	31	55	24	52	560	1004	444	102	860	1575	715
3	47	83	36	53	566	1016	450	103	865	1584	719
4	62	110	48	54	573	1029	456	104	870	1593	723
5	77	137	60	55	579	1041	462	105	874	1602	728
6	92	164	72	56	586	1054	468	106	879	1612	733
7	106	190	84	57	592	1066	474	107	884	1621	737
8	121	217	96	58	599	1079	480	108	888	1630	742
9	136	243	107	59	605	1091	486	109	893	1639	746
10	150	269	119	60	612	1103	491	110	897	1648	751
11	164	294	130	61	619	1116	497	111	902	1657	755
12	179	319	140	62	625	1128	503	112	907	1666	759
13	193	344	151	63	632	1141	509	113	911	1674	763
14	206	368	162	64	638	1153	515	114	916	1682	766
15	219	392	173	65	645	1165	520	115	920	1690	770
16	232	415	183	66	651	1177	526	116	925	1698	773
17	245	438	193	67	658	1190	532	117	929	1706	777
18	257	460	203	68	664	1202	538	118	934	1714	780
19	269	482	213	69	671	1214	543	119	938	1722	784
20	281	503	222	70	677	1226	549	120	942	1729	787
21	293	524	231	71	683	1238	555	121	947	1737	790
22	305	545	240	72	690	1250	560	122	952	1744	792
23	317	565	248	73	696	1262	566	123	957	1752	795
24	328	584	256	74	702	1274	572	124	961	1759	798
25	338	603	265	75	709	1286	577	125	966	1766	800
26	348	622	274	76	715	1297	582	126	970	1773	803
27	358	641	283	77	721	1309	588	127	974	1780	806
28	368	659	291	78	727	1320	593	128	978	1787	809
29	378	677	299	79	733	1332	599	129	983	1794	811
30	388	694	306	80	739	1343	604	130	988	1801	813
31	398	711	313	81	745	1355	610	131	992	1807	815
32	407	728	321	82	750	1366	616	132	996	1814	818
33	416	744	328	83	756	1377	621	133	1001	1821	820
34	425	760	335	84	762	1388	626	134	1005	1827	822
35	433	775	342	85	768	1399	631	135	1009	1833	824
36	442	790	348	86	773	1410	637	136	1014	1840	826
37	450	804	354	87	779	1421	642	137	1018	1846	828
38	458	818	360	88	785	1432	647	138	1023	1852	829
39	466	832	366	89	790	1443	653	139	1027	1858	831
40	475	847	372	90	796	1454	658	140	1031	1864	833
41	483	861	378	91	801	1464	663	141	1035	1869	834
42	491	875	384	92	807	1475	668	142	1039	1875	836
43	498	888	390	93	812	1485	673	143	1043	1881	838
44	506	902	396	94	818	1496	678	144	1047	1886	839
45	513	915	402	95	823	1506	683	145	1051	1892	841
46	520	928	408	96	829	1516	687	146	1055	1897	842
47	527	941	414	97	834	1526	692	147	1059	1902	843
48	534	954	420	98	840	1536	696	148	1063	1907	844
49	540	966	426	99	845	1546	701	149	1067	1912	845
50	547	979	432	100	851	1556	705	150	1071	1917	846

The International Seismological Summary for 1920 July, August, September.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

Since the last number of the Summary was sent to press the Geodetic and Geophysical Union has held a meeting in Madrid, and I cannot refrain from one or two words of grateful thanks for the great hospitality and kindness, as well as the splendid organisation of our Spanish hosts. It is no light matter to make arrangements for 150 people of different nationalities, and the success attained bears witness to the devotion and hard work of all concerned, especially of Sr. Cubillo, the President of the Spanish National Committee, and Col. Galbis, the organising Secretary.

The Seismology Section was well attended, though we regretted some notable absences, especially those of our Vice-President, Sr. Oddone, and Sr. Agamennone, and of M. de Quervain; friendly messages were sent to these, and at the moment of writing I have just received, as President of the Section, a letter of thanks from Sr. Agamennone, who has just completed 25 years as Director of the Observatory at Rocca di Papa.

At the meeting of the Section the form of this Summary was discussed, and only one immediate suggestion was made, viz.; that where possible it should be noted whether a wave was condensational or dilational by adding the letters C or D to the readings. This addition cannot be made at once, as the copy for press is already prepared to the end of 1920, but it will be undertaken as from Jan. 1, 1921. Attention was drawn at the meeting to the commencement of a new publication from the Central Bureau, which will contain memoirs of various seismological matters, and the President was requested to give therein an account of the method for assigning the depth of focus of an earthquake, to which reference has already been made at various times in this Summary. In the present number attention may be called to the cases of abnormal focus on the following dates:

Date.	Epicentre.	Depth.
d. h.	° °	
July 2 18	7°0S. 153°0E.	+0·070 below normal
20 12	33°8N. 140°5E.	+0·010 „ „
Aug. 3 3	6°5N. 128°0E.	+0·040 „ „
15 8	13°0S. 166°8E.	+0·030 „ „

and also to the following case of *normal* focus

Sept. 20 14	20°6S. 168°8E.	0·000
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for the reason that there are numerous observations of [P] in Europe. We may collect them as follows, in order of magnitude :

$$+20+12+11+9+8+8+8+7+6+4+4+3+3+2+2+1+1+1$$

$$0 \quad 0 \quad 0-1-3-3-4-5-5-6-6-6-8$$

The algebraic mean of the 31 is [+2s.], and the median is [+1s.]. The mean numerical value is $\pm 5s.$ Considering the variety of instruments and stations these results may be regarded as closely accordant.

From Sept. 6—16 there are a number of shocks from the epicentre 43°·8N. 11°·2E., and it is natural to enquire how far they support the hypothesis of a 21-minute period, which has been already mentioned several times. But recent work has essentially modified this hypothesis. It seems probable that the periodicity is in some way controlled by the Moon, and in particular that the period is $1/68$ of a lunar day (about 22min.). Now the lunar day is, of course, variable, and though it is easy to obtain general evidence of the relation between the earthquake periodicity and the mean lunar day, the special manner in which the variations of the lunar day affect the periodicity are more difficult to identify. The shocks mentioned above give a good illustration of the situation. In the following table the first two columns give the date and time (O) of the principal shocks, to 0·1 min : the third the number of periods (N) of exactly 22·0 min. elapsed since the first shock : the fourth (C) the minutes (omitting days and hours, to be inferred from (O) of the product 22N. : and the fifth the residual O—C. Now the lunar day is at first very close to $68 \times 22 \cdot 0 \text{ min.}$, and retains this approximate value to about $N=300$. The column M gives a correction to reduce to the Moon's meridian passage, interpolating for values of N between passages. It includes an arbitrary zero, adjusted so as to make the residuals (O—C)+M zero in the mean.

Shocks from 43°·8N. 11°·2E., compared with lunar influence.

Date.	Time (O). h. m.	N.	C. m.	O - C. m.	M. m.	O - C + M. m.
Sept. 6	14 5·4	0	0	+ 5·4	- 7·6	- 2·2
7	5 55·7	43	46	+ 9·7	- 9·4	+ 0·3
7	8 11·0	49	53	+13·0	- 9·6	+ 3·4
7	10 14·8	55	10	+ 4·8	- 9·8	- 5·0
7	11 26·4	53	16	+10·4	- 9·9	+ 0·5
7	13 32·3	64	28	+ 4·3	-10·0	- 5·7
7	18 42·7	78	36	+ 6·7	-10·5	- 3·8
8	1 19·2	96	12	+ 7·2	-11·2	- 4·0
8	9 41·4	119	38	+ 3·4	-11·9	+ 3·5
8	18 43·8	143	26	+17·8	-12·2	+ 5·6
11	2 19·7	295	10	+ 9·7	- 9·6	+ 0·1
11	3 50·4	299	38	+12·4	- 8·9	+ 3·5
11	14 32·8	328	16	+16·8	- 8·1	+ 8·7
12	16 31·4	400	40	- 8·6	- 2·2	-10·8
16	4 17·0	629	38	-21·0	+21·7	+ 0·7
16	18 28·8	668	56	-27·2	+26·4	- 0·8

These residuals are all small except two for N=328 and N=400. [Is this possibly connected with the fact that the Moon is then passing the Sun? If the influence is tidal, the sun would also have an influence]. The mean numerical value of the residuals is $\pm 3\cdot7$ min. If they were scattered at random from $-11\cdot0$ min. to $+11\cdot0$ min., the mean value would be $\pm 5\cdot5$ min. To put the matter in another way, 14 of the 16 are contained within the limits $-5\cdot7$ m. to $+5\cdot6$ m., just over half the period, only the exceptional 2 above noticed being in the remaining $10\cdot7$ min. of the period.

As regards the smaller shocks on Sept. 7 and 8; these were reduced in precisely the same way as those above, to obtain a column O-C+M. These values were then collected in 12 groups from $-11\cdot0$ m. to $+11\cdot0$ m., as follows:—

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5	1	3	7	6	4	6	3	0	2	5	3

the first group extending from $-11\cdot0$ m. to $9\cdot2$, and containing 5 residuals; the second from $-9\cdot3$ to $-7\cdot2$, and containing 1; and so on. It will be seen that the large numbers are in groups (4) to (7), *i.e.*, from $-5\cdot5$ m. to $+1\cdot7$ m., near zero but having a mean negative value. Analyzing the 12 groups harmonically the maximum is found to be at $-3\cdot5$ m. If we take the mean numerical value of the 45 residuals as they stand it comes out $\pm 5\cdot0$, not much less than $5\cdot5$. If we reduce to mean value $-3\cdot5$ m.

it comes out ± 4.4 . The zero value was adopted in the table rather arbitrarily, and may be a little excessive. Putting all the residuals together, the 12 groups become

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
6	1	4	10	7	5	10	6	0	3	6	3

Groups (4) to (7) thus contain 32 residuals : Groups (12) to (3) contain 14, and groups (8) to (11) contain 15. Or again the six groups (3) to (8) contain 42 residuals, the other six only 19. On the whole there is fair support for the hypothesis of variation in this period of $1/68$ of a lunar day, which was independently deduced from quite other evidence.

In the present number of the Summary old epicentres have been used on 49 occasions ; and 31 new ones adopted.

H. H. TURNER.

University Observatory, Oxford.
1924 November 20.

1920 JULY, AUGUST, & SEPTEMBER.

July 1d. 19h. 57m. 31s. Epicentre $36^{\circ}1'N$. $137^{\circ}3'E$. (as on 1920 May 28d.).

$$A = -.594, B = +.548, C = +.589.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	\circ	m. s.	s.	m. s.	s.	m.	m.
Tokyo	2.0	0 43	+12	—	—	1.4	1.4
Osaka	2.1	—	—	0 58	0	1.6	2.5
Kobe	2.2	—	—	0 50	-10	1.7	1.9
Mizusawa	E. 4.3	1 7	0	1 58	0	—	—
	N. 4.3	1 8	+1	2 6	+8	—	—

Tokyo readings have been increased by 1min. Kobe gives $MN = +1.8m$.

July 1d. Readings also at 0h. (San Fernando), 2h. (Colombo and Kodaikanal), 3h. (Pompeii, Rocca di Papa, Kodaikanal (2), and near Athens), 13h. (La Paz), 14h. (Kodaikanal), 15h. (Helwan, Barcelona, and Balboa Heights), 16h. (La Paz (2)), 17h. (Uccle, Helwan, Strasbourg, and De Bilt), 18h. (Kodaikanal), 19h. (La Paz), 20h. (Florence), 21h. (Lick and near Batavia), 22h. (San Fernando and near Algiers), 23h. (Lick and Apia).

1920. July 2d. 18h. 41m. 5s. Epicentre $7^{\circ}0'S$. $153^{\circ}0'E$.

(as on 1918 Dec. 25d.).

$$A = -.884, B = +.451, C = -.122; D = +.454, E = +.891;$$

$$G = +.109, H = -.055, K = -.992.$$

A focal depth of .070 below normal is now supported by the antipodal stations, though no such support was forthcoming on 1918 Dec. 25d. But the determination of T_0 from the stations near the Epicentre is not very well supported. An error of 2min. in Riverview P is presumed.

Station and Component.	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	\circ	\circ		m. s.	s.	m. s.	s.	m.	m.
Riverview	-3.8	26.9	183	i 3 14	-124	i 9 23	-4	e 12.1	14.0
Sydney	-3.8	26.9	183	—	—	9 37	+10	12.0	15.1
Adelaide	-4.3	30.9	201	e 5 55	+1	i 10 25	-8	i 12.9	17.5
Melbourne	-4.4	31.6	192	—	—	10 37	-8	14.8	16.6
Manila	-5.2	38.4	306	e 6 41	-17	—	—	17.5	19.2
Christchurch	-5.4	40.4	158	—	—	11 49	-66	20.2	22.5
Perth	-5.6	42.8	229	7 51	+21	14 7	+43	17.1	—
Taihoku	-5.7	44.3	320	14 0	? S	(14 0)	+14	19.0	—
Batavia	-5.8	45.8	271	e 7 43	-12	i 14 34	+27	e 23.9	—
Mizusawa	E. -5.9	47.4	350	7 35	-32	14 22	-6	—	—
	N. -5.9	47.4	350	7 34	-33	14 14	-14	—	—
Zi-ka-wei	-6.0	48.7	324	e 8 48	+32	—	—	—	—
Honolulu	-6.4	55.7	60	9 25	+23	17 13	+63	e 25.9	34.5
Berkeley	N. -8.8	90.1	50	e 11 55	-33	e 22 41	0	e 41.3	—
Victoria	-8.6	91.1	42	22 59	? S	(22 59)	+7	40.7	46.6
Mauritius	-8.7	92.3	250	42 55	? L	—	—	47.4	49.4
Chicago	—	116.7	45	18 37	? PR ₁	28 13	-11	e 49.6	—
Ann Arbor	—	119.0	43	56 31	? L	—	—	(56.5)	—
Helwan	—	120.8	300	19 55	? PR ₁	—	—	—	—
Toronto	—	121.5	40	—	—	—	—	e 62.5	70.8
Ottawa	—	123.2	39	—	—	e 34 55	? PR ₁	e 51.9	—
Ithaca	—	123.9	41	—	—	—	—	58.9	—
Hamburg	—	124.7	335	e 18 3	[-62]	—	—	e 55.9	68.9
Georgetown	—	124.7	45	—	—	—	—	e 58.4	—
Washington	—	124.7	45	—	—	—	—	e 58.4	—
Vienna	—	124.8	327	18 5	[-60]	—	—	e 63.9	74.5
Northfield	—	125.6	38	—	—	—	—	e 61.9	—
Edinburgh	—	127.6	342	19 55	? PR ₁	—	—	—	—
De Bilt	—	127.8	335	e 20 16	? PR ₁	e 34 43	? SR ₁	e 55.9	72.2

Continued on next page.

Station and Component.	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Eskdalemnir	—	128.1	342	e 21 27	? PR ₁	—	—	52.9	—
Uccle	—	129.0	334	18 9	—67	—	—	56.9	62.9
Padova	—	129.0	326	17 55	—81	20 55	? PR ₁	—	—
Strasbourg	—	129.1	331	e 18 11	—65	—	—	e 62.9	80.6
Stonyhurst	—	129.2	340	20 49	? PR ₁	—	—	—	83.4
Oxford	—	130.5	339	21 39	? PR ₁	—	—	—	76.9
Rocca di Papa	—	130.6	321	i 18 22	—58	21 40	? PR ₁	e 68.4	77.4
Paris	—	131.3	334	18 16	—66	38 39	? SR ₁	61.9	71.9
Moncalieri	—	131.6	328	e 18 16	—66	28 47	?	67.6	81.4
La Paz	—	133.0	120	i 18 20	—65	31 19	?	61.4	65.8
Algiers	—	139.5	322	e 17 50	—108	22 7	? PR ₁	e 49.9	50.4
Coimbra	—	142.8	337	e 19 45	[0]	—	—	70.9	79.9

Additional readings: Riverview gives also PR₂ = +5m.31s., PS = +9m.41s., SR₂ = +11m.5s., MN = +13.7m., MZ = +20.6m., T₀ = 18h.36m.24s. Adelaide i = +11m.49s. Melbourne SR₁ = +13m.1s. Manila MN = +18.4m. Christchurch SR₁? = +15m.7s. Honolulu SR₂ = +22m.49s. T₀ = 18h.40m.48s. Berkeley ePEV = +11m.54s., eLE = +40.6m., T₀ = 18h.40m.9s. Victoria S = +28m.53s., MV = +45.9m. Chicago L = +55.4m., L = +60.9m., L = +68.9m. Helwan PN = +23m.55s. Toronto L? = +57.6m., iL = +83.1m. Ottawa PR₁? = +29m.55s., L = +65.9m., LE = +74.9m. and +88.9m. Georgetown LE = +64.4m., LN = +64.2m. Washington LE = +66.9m. and +73.9m. Northfield L = +65.9m. De Bilt ePR₁ = +21m.27s., MN = +69.4m. Uccle PR₁ = +21m.37s., MN = +70.7m. Strasbourg PR₁ = +21m.34s. Paris i = +21m.42s. (?PR₁), MN = +74.9m. La Paz i = +21m.47s. (?PR₁), T₀ = 18h.43m.52s. Coimbra e = +42m.55s., eLN = +65.8m., LE = +80.9m.

1920. July 2d. 21h. 36m. 45s. Epicentre 3°5S. 128°5E.

(as on 1919 Aug. 29d.).

A = -621, B = +781, C = -061: D = +783, E = +622;
G = +038, H = -048, K = -998.

The residuals suggest a few tenths of a degree further north.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	19.5	338	e 4 40	+5	—	—	9.0	—
Batavia	21.7	262	5 6	+5	i 8 49	-10	—	10.0
Taihoku	29.3	347	6 29	+8	(11 20)	-2	11.3	—
Perth	31.0	201	7 48	+70	11 43	-8	17.4	—
Adelaide	32.8	165	e 7 51	+56	i 12 33	+12	i 16.0	21.4
Riverview	37.0	146	i 7 31	+1	e 13 28	+4	e 16.0	30.4
Sydney	37.0	146	13 33	?S	(13 33)	+9	25.0	29.0
Melbourne	37.5	160	8 15	+41	14 3	+32	17.6	23.8
Osaka	38.8	10	7 42	-2	—	—	—	13.7
Nagoya	39.5	11	7 40	-11	—	—	—	—
Tokyo	40.6	15	8 3	+3	—	—	e 13.1	14.6
Mizusawa	44.2	15	8 21	-6	14 46	-19	—	—
	N.	44.2	15	8 22	-5	14 48	-17	—
Calcutta	47.0	307	8 51	+4	(15 27)	-14	15.4	—
	E.	47.0	307	9 15	+28	(16 3)	+22	16.0
	N.	49.6	282	9 15	+11	20 15	?SR ₁	32.2
Colombo	51.7	12	9 9	-9	—	—	—	34.2
Ootomari	55.9	142	—	—	17 45	+12	36.2	48.8
Christchurch	59.8	310	9 39	-32	(e 17 39)	-42	e 17.6	29.6
Simla	70.8	250	24 27	?SR ₁	—	—	32.8	35.0
Mauritius	76.0	67	12 27	+32	22 51	+74	e 39.2	48.6
Honolulu	104.4	232	—	—	—	—	—	25.8
Cape Town	104.6	40	21 52	?	—	—	—	58.3
Victoria	107.2	320	i 14 32	-13	i 19 2	?PR ₁	e 56.2	83.6
Vienna	109.4	326	e 14 42	-13	i 25 33	-110	e 56.2	61.2
Hamburg	110.0	312	18 18	[- 4]	28 15	+47	—	—
Pompeii	110.9	318	18 29	[+ 4]	24 42	-174	—	—
Padova	111.4	313	e 19 9	?PR ₁	e 26 42	-59	e 61.8	73.9
Rocca di Papa	111.8	316	14 22	-44	—	—	—	14.5
Florence	112.6	326	e 19 15	?PR ₁	e 29 16	+85	e 55.2	69.8
De Bilt	112.6	320	e 18 36	[- 6]	e 29 26	+95	e 54.2	72.8
Strasbourg	113.6	325	—	—	e 29 15	+76	e 58.2	74.2
Uccle	113.9	318	i 19 46	?PR ₁	30 26	?	59.3	—
Moncalieri	114.9	331	20 15	?PR ₁	—	—	—	—
Edinburgh								

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Eskdalemuir	115.3	331	19 48	?PR ₁	—	—	55.2	—
Paris	115.6	323	e 15 11	-12	e 29 29	-7.4	61.2	67.2
Stonyhurst	115.8	329	20 9	?PR ₁	(29 39)	?	—	66.2
Oxford	116.3	327	i 20 5	?PR ₁	—	—	—	—
Algiers	120.0	311	e 20 6	?PR ₁	30 15	?	73.2	—
Coimbra	126.6	320	21 15	?PR ₁	29 35	-2	67.2	—
Chicago	130.0	34	21 35	?PR ₁	31 45	?	67.8	—
Toronto	132.9	26	—	—	—	—	65.4	74.4
Ottawa	133.0	21	e 19 9	[-16]	—	e 23.0	—	—
Georgetown	137.7	30	e 23 40	?PR ₁	32 40	?	50.6	—
Washington	137.7	30	19 42	[-7]	22 30	?PR ₁	—	—
La Paz	154.1	141	e 20 1	0	34 29	?	80.8	97.0

Additional readings and notes: Batavia gives also $iP_2 = +5m.32s.$, $S_2 = +9m.12s.$, $MN = +12.3m.$, $L = +24.1m.$ Taihoku $e = +8m.40s.$?PR₁. Adelaide $i = +14m.3s.$ Riverview PR₁ $= +9m.7s.$ and $+9m.17s.$, PR₂ $= +9m.47s.$, PS $= -13m.48s.$, MZ $= -18.2m.$, MN $= +23.9m.$, T₀ $= 21h.36m.36s.$ Sydney PS $= +18m.27s.$, S $= +20m.51s.$ Osaka MN $= +14.2m.$ Tokyo MN $= +14.5m.$ Christchurch PR₁? $= -10m.15s.$ Lemberg gives 21h.50m. to 22h.30m. Vienna PR₁? N $= +19m.0s.$ Hamburg iZ $= -19m.17s.$ MN $= -59.2m.$ De Bilt MN $= +61.0m.$, T₀ $= 21h.37m.2s.$ Epicentre 2.6S, 127.1E. Strasbourg PR₁ $= +22m.1s.$ Uccle PR₁ $= +19m.43s.$ Eskdalemuir L reading has been increased by one hour. Paris $e = +19m.22s.$ Coimbra LN $= +37.2m.$ Chicago eL $= +54.5m.$, L $= +78.2m.$ Toronto readings have been increased by 1h. Georgetown readings have been increased by 30m. La Paz iP $= +19m.21s.$, T₀ $= 21h.35m.36s.$

July 2d. Readings also at 0h. (near La Paz), 2h. (Kodaikanal), 5h. (near Tokyo), 6h. (Strasbourg and near Algiers), 8h. (Apia and Batavia), 9h. (Florence, Uccle, Rocca di Papa, and Strasbourg), 10h. (Batavia, Colombo, Helwan, and Zi-ka-wei), 12h. (Stonyhurst and Taihoku (2)), 13h. (San Fernando), 14h. (near Athens and Stonyhurst), 15h. (Zi-ka-wei), 17h. (Tokyo), 20h. (Stonyhurst, Padova, Vienna, Strasbourg, San Fernando, and Rocca di Papa).

July 3d. 14h. 19m. 0s. Epicentre 36°-1N. 137°-3E. (as on July 1d.).

$$A = -.591, B = -.548, C = -.589.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	2.0	0 34	-3	—	—	0.8	—
Osaka	2.1	—	—	1 10	+12	2.1	3.1
Mizusawa	E. 4.3	1 4	-3	1 42	-16	—	—
De Bilt	82.5	—	—	—	—	e 47.0	52.8
Paris	86.1	—	—	—	—	e 54.0	—
La Paz	150.1	19 55	[-1]	—	—	—	—

Additional readings: Mizusawa PN $= +1m.5s.$ De Bilt MN $= +56.7m.$

July 3d. 16h. 34m. 36s. Epicentre 15°-0N. 94°-5W.

$$A = -.076, B = -.963, C = +.259; D = -.997, E = +.078;$$

$$G = -.020, H = -.258, K = -.966.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tacubaya	N. 6.3	314	1 29	-7	—	—	3.8	4.0
Chicago	27.4	11	6 2	0	10 37	-11	e 14.4	—
Toronto	31.4	21	—	—	—	—	17.9	—
La Paz	40.9	140	7 59	-3	—	—	19.5	30.8
Victoria	40.9	332	17 11	?SR ₁	—	—	21.1	24.1
Edinburgh	78.4	35	—	—	22 24	+19	—	—
San Fernando	79.8	55	6 24	?	—	—	—	—
Paris	83.3	41	e 12 37	-1	e 23 0	0	43.4	48.4
Uccle	83.9	40	e 12 31	-10	e 23 6	-2	e 40.4	—
De Bilt	E. 84.0	38	12 43	+1	23 5	-3	e 39.4	45.2
Puy de Dôme	84.4	44	e 11 54	-50	—	—	—	—
Hamburg	86.3	35	e 12 59	+4	e 23 36	+3	e 45.4	—
Strasbourg	86.7	40	e 12 58	1	e 23 36	-2	e 46.4	—
Rocca di Papa	E. 92.4	45	e 13 24	-5	23 12	-57	—	—
	N. 92.4	45	e 13 21	-8	e 23 24	-75	—	—

Additional readings: Tacubaya gives PE $= +2m.27s.$, ME $= +3.9m.$, Paris MN $= +57.4m.$ De Bilt eN $= +12m.52s.$ and $+23m.9s.$, MN $= +45.0m.$, T₀ $= +16h.34m.55s.$

July 3d. Readings also at 0h. (Rio Tinto and Lick), 6h. (Helwan), 15h. (Batavia), 17h. (Oaxaca), 18h. (Lick and Taihoku), 19h. (Apia), 22h. (Taihoku and Stonyhurst), 23h. (Acra).

July 4d. 0h. 11m. 35s. Epicentre $2^{\circ}08.14'0W$.

A = +.970, B = -.242, C = -.035; D = -.242, E = -.970;
G = -.034, H = +.008, K = -.999.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
San Fernando	39.1	10	8 15	+28	15 25	+92	20.9	22.4
Granada	40.4	12	7 42	-16	13 55	-18	—	—
Algiers	41.9	22	7 59	-11	14 17	-17	21.4	26.4
Coimbra	42.5	6	9 16	+61	14 22	-20	20.8	24.7
	42.5	6	8 12	-3	—	—	22.7	23.5
Cape Town	44.0	140	13 32	?S	(13 32)	-90	—	22.5
Tortosa	44.8	16	8 41	+9	15 1	-11	e 21.4	29.6
Barcelona	45.9	18	e 9 24	+45	—	—	17.9	25.8
Rocca di Papa	50.0	27	i 9 4	-3	e 16 10	-9	e 25.8	28.2
Pompeii	50.1	29	9 7	-1	16 37	+17	27.4	—
Moncalieri	50.8	20	9 13	+1	19 1	?	25.7	28.6
Florence	51.1	24	16 25	?S	(16 25)	-7	—	29.4
Paris	52.8	13	i 9 22	-3	e 16 49	-5	e 25.4	31.4
Helwan	53.7	50	17 19	?S	(17 19)	+14	—	30.0
	53.7	50	14 25	?	—	—	—	28.5
Strasbourg	54.0	19	e 9 32	-1	17 4	-5	e 19.4	29.5
Oxford	54.9	10	9 25	-13	—	—	—	33.3
Uccle	55.1	14	e 9 38	-2	i 17 16	-6	e 22.4	29.0
La Paz	55.2	252	i 9 41	+1	17 27	+3	26.7	30.9
De Bilt	56.5	14	9 51	+2	17 41	+1	26.4	33.1
Stonyhurst	56.7	9	17 25	?S	(17 25)	-17	(23.9)	33.9
Vienna	56.8	24	i 9 52	+1	—	—	—	37.9
Eskdalemuir	58.0	8	10 25	+26	—	—	—	—
Edinburgh	58.6	8	—	—	—	—	—	35.4
Hamburg	59.1	16	i 10 7	+1	e 18 16	+4	29.9	32.4
Toronto	73.9	317	—	—	—	—	41.0	—
Chicago	79.2	314	21 58	?S	(21 58)	-16	e 36.4	—
Colombo	94.1	85	54 25	?L	—	—	(54.4)	59.4
Victoria	104.2	320	51 3	?L	—	—	(51.0)	56.0

Additional readings: San Fernando gives MN = +21.9m. Algiers PR₁ = +9m.48s., MN = +22.1m., T₀ = 0h.11m.36s. Rocca di Papa e = +9m.1s., i = +10m.56s. Uccle MN = +32.8m., T₀ = 0h.11m.40s. De Bilt SN = +17m.30s., PR₁N = +11m.51s., MN = +37.5m., T₀ = 0h.11m.52s. Stonyhurst P = 0h.7m.0s. Edinburgh P = 0h.4m.0s. Hamburg MNZ = +36.1m., T₀ = 0h.11m.36s. Toronto L = +46.0m. Chicago S? = +26m.25s. (?SR₁), L = +38.4m. and +43.4m.

July 4d. 12h. 17m. 58s. I } Epicentre $37^{\circ}5N. 29^{\circ}0E$.
20h. 45m. 40s. II }

A = +.694, B = +.385, C = +.609; D = +.485, E = -.875;
G = +.533, H = +.295, K = -.793.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Athens	4.2	277	e 1 2	-3	—	—	e 1.6	1.9
II Uccle	4.2	277	e 1 0	-5	—	—	1.6	2.3
I Helwan	7.9	165	8 2	?	—	—	—	—
II	7.9	165	5 20	?L	—	—	(5.3)	—
II Pompeii	11.7	291	4 22	?S	(4 22)	-50	—	—
I Rocca di Papa	13.3	294	i 3 29	+12	—	—	e 7.3	—
I Uccle	13.3	294	i 3 15	-2	—	—	—	6.1
II	13.3	294	e 2 40	-29	5 56	+5	—	9.5
II Vienna	14.1	324	—	—	—	—	e 6.3	11.2
II Moncalieri	17.6	302	—	—	—	—	10.5	—
I Strasbourg	19.0	312	e 4 32	+3	—	—	e 11.4	—
II	19.0	312	e 4 32	+3	e 8 2	0	—	11.3
II Hamburg	20.8	327	—	—	e 8 20	-20	—	17.1
I Uccle	22.0	315	e 5 2	-3	e 9 2	-3	—	—
II	22.0	315	e 5 2	-3	e 8 56	-9	—	—
I Paris	22.2	309	—	—	e 9 2	-7	—	—
II	22.2	309	—	—	e 9 6	-3	—	12.3
I De Bilt	22.2	319	—	—	e 9 15	+6	e 11.8	13.5
II	22.2	319	—	—	e 9 8	-1	e 12.1	13.4
II Edinburgh	28.3	321	—	—	—	—	15.3	—

Additional readings: Athens I MN = +2.3m. Athens II MN = +1.9m.
Helwan I PE 10m.2s. Helwan II PE 7m.20s. Rocca di Papa I
eN = +0m.2s. Rocca di Papa II i = +3m.23s. De Bilt I eSN =
+9m.12s., MN = +14.8m. De Bilt II eSE = +9m.14s., MN = +14.8m.

July 4d. Readings also at 2h. (La Paz), 4h. (near Mizusawa and Tokyo), 7h. (near Mizusawa), 8h. (Manila), 9h. (De Bilt, Paris, Edinburgh, Strasbourg, Vienna, Helwan, Uccle, Eskdalemuir, and Hamburg, probably from an origin in S.E. Europe, also Kodaikanal), 10h. (near Mizusawa and Tokyo), 12h. (near Tacubaya); 13h. (near Taihoku), 17h. (Batavia), 21h. (Florence), 23h. (San Fernando).

July 5d. Readings at 3h. (Batavia), 9h. (Florence), 10h. (Paris and near Mizusawa, Tokyo, and near Chicago), 11h. (Batavia), 13h. (Florence), 15h. (Manila), 16h. (Taihoku), 17h. and 19h. (Melbourne and near Tacubaya).

July 6d. 3h. 0m. 40s. Epicentre $15^{\circ}7'S$. $167^{\circ}3'E$. (as on 1919 Aug. 31d.).

A = -·939, B = +·212, C = -·271; D = +·220, E = +·975;
G = +·264, H = -·059, K = -·963.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Apia	20·3	87	e 5 32	+47	8 49	+20	10·9	—
Riverview	23·4	216	i 5 25	+4	i 9 38	+5	e 11·4	15·0
Sydney	23·4	216	4 38	-43	9 50	+17	13·5	14·8
Christchurch	28·2	172	7 14	+64	11 56	+53	14·1	19·3
Perth	49·3	240	8 23	-39	—	—	—	—
Honolulu	50·3	44	e 8 32	-37	16 20	-3	e 27·3	33·3
Manila	54·9	301	e 10 10	+32	(17 14)	-6	17·2	17·8
Tokyo	57·6	334	e 9 50	-6	—	—	e 14·0	—
Osaka	58·8	330	10 33	+29	—	—	—	18·6
Batavia	59·9	272	e 10 38	+27	—	—	—	19·6
Mizusawa	E. 60·0	337	9 43	-29	17 55	-28	—	—
	N. 60·0	337	10 10	-2	18 9	-14	—	—
Taihoku	60·4	312	e 10 25	+10	(18 29)	+1	—	—
Zi-ka-wei	64·1	319	—	—	e 17 48	+86	—	—
Victoria	88·7	38	23 41	?S	(23 41)	-19	—	43·3
Kodaikanal	92·6	280	58 44	?L	—	—	(58·7)	—
Chicago	111·6	50	25 17	?S	(25 17)	-145	59·3	—
La Paz	116·5	119	e 20 41	?PR ₁	(29 54)	+92	29·9	—
Toronto	117·6	47	—	—	—	—	e 36·9	—
Helwan	137·3	297	23 20	?PR ₁	—	—	—	—
Hamburg	138·2	340	e 22 30	?PR ₁	—	—	e 61·3	—
Edinburgh	139·2	351	—	—	39 20	?SR ₁	—	—
Vienna	139·7	330	e 19 20	[-19]	i 23 1	?PR ₁	—	69·0
Eskdalemuir	139·7	351	27 20	?	—	—	—	—
De Bilt	140·9	341	e 20 13	[+32]	e 41 5	?	e 61·3	62·8
Uccle	142·3	341	e 23 20	?PR ₁	—	—	—	—
Strasbourg	143·1	336	e 19 55	[+10]	e 34 20	?	—	69·3
Padova	143·8	330	(18 56)	[-51]	18 56	?P	—	—
Paris	144·6	344	i 19 49	[+1]	e 41 45	?	63·3	79·3
Pompeii	145·6	322	19 54	[+5]	—	—	—	—
Rocca di Papa	146·0	325	i 19 55	[+5]	—	—	—	20·4
Tortosa	152·4	338	20 1	[+2]	—	—	45·8	78·8
Algiers	154·7	329	e 20 20	[+18]	25 50	?PR ₁	49·3	—
Coimbra	155·2	352	—	—	e 33 20	?	e 49·3	—

Additional readings: Apia gives L = +11·3m. Riverview iP = +6m.0s.,
PR₁ = +6m.35s., PS = +9m.49s. and +10m.35s., MN = +12·6m., MZ =
+15·2m., T₀ = 3h.0m.43s. Honolulu iSR₁ = +21m.14s., T₀ = 2h.59m.30s.
Manila MN = -18·2m. Taihoku gives its S reading as an independent P.
Chicago S = +35m.24s., eL = +49·3m., L = +69·3m. Helwan PN =
+34m.20s. De Bilt ePR₁ = +23m.7s., MN = +79·0m. Padova P =
+14m.30s.

July 6d. Readings also at 0h. (San Fernando), 4h. (Toronto), 5h. (Riverview and Christchurch), 6h. (Helwan and Paris), 9h. (Taihoku), 12h. (La Paz),
15h. (La Paz, Kodaikanal, and near Mizusawa), 17h. (Florence), 18h.
(Zi-ka-wei and Taihoku), 19h. (Taihoku (3)), 20h. (Zi-ka-wei), 21h.
(Manila), 22h. (Taihoku).

1920. July 7d. 18h. 41m. 24s. Epicentre 60°·2N. 138°·0W.

A = -·369, B = -·332, C = +·868; D = -·669, E = +·743;
G = -·645, H = -·581, K = -·497.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Sitka	N.	3·5	155	1 25	+30	—	—	2·9	3·0
Victoria	N.	14·5	138	6 38	?S	(6 38)	+18	8·1	9·1
	V.	14·5	138	5 6	?	5 26	-54	10·6	13·8
Tucson		33·2	135	—	—	—	—	17·8	19·8
Chicago		35·5	99	7 16	- 2	13 4	+ 1	15·4	19·8
Ann Arbor	E.	37·0	93	6 54	-36	13 24	0	20·5	19·9
Toronto		38·5	89	—	—	—	—	i 21·2	21·5
Ottawa		38·7	82	7 40	- 4	13 36	-12	c 18·6	—
Northfield		41·1	81	6 31	-93	—	—	—	22·2
Honolulu		41·4	209	—	—	—	—	17·8	19·6
Georgetown	E.	42·9	90	c 8 16	- 1	15 6	+19	e 22·8	23·9
	N.	42·9	90	c 8 16	- 1	14 56	+ 9	e 23·0	24·0
Washington		42·9	90	8 16	- 1	14 56	+ 9	—	24·0
Cheltenham	E.	43·1	90	15 0	?S	(15 0)	+11	22·7	24·2
	N.	43·1	90	18 36	?SR ₁	—	—	23·2	24·3
Edinburgh		58·5	28	—	—	18 6	+ 1	—	34·4
Eskdalemuir		59·0	28	10 5	0	18 9	- 2	29·1	35·6
Stonyhurst		60·6	29	22 54	?SR ₁	33 24	?L	(33·4)	35·1
Oxford		62·7	29	10 33	+ 3	19 0	+ 3	31·0	38·6
Hamburg		63·4	20	e 10 34	0	e 19 10	+ 4	e 32·6	39·6
De Bilt	E.	63·8	24	10 39	+ 2	19 15	+ 4	c 34·6	38·6
	N.	63·8	24	—	—	—	—	e 32·6	36·8
Uccle		64·9	25	e 10 44	0	e 19 24	0	e 31·6	38·0
Paris		66·4	27	e 10 57	+ 3	(e 18 49)	-53	33·6	34·6
Strasbourg		67·7	21	e 11 3	+ 1	20 2	+ 4	—	44·0
Lemberg		69·0	11	—	—	e 20 6	- 8	—	20·2
Puy de Dôme		69·4	28	e 10 36	-37	—	—	—	—
Vienna		69·5	18	i 12 13	+59	20 24	+ 4	e 34·6	46·6
Moncalieri		71·1	25	11 25	+ 1	24 45	?SR ₁	38·2	44·9
Coimbra		71·4	38	e 10 16	-70	16 56	?PR ₁	25·2	38·0
Barcelona		73·2	29	—	—	—	—	e 41·4	44·3
Tortosa		73·4	31	11 36	- 2	21 8	+ 1	29·5	47·3
Rocca di Papa	N.	75·2	21	11 47	- 3	21 24	- 4	e 42·3	55·7
San Fernando		75·6	38	21 18	?S	(21 18)	-15	40·6	45·6
Granada		75·7	36	11 57	+ 4	i 21 40	+ 6	—	—
Manila		82·8	286	e 40 42	?L	—	—	(e 40·7)	—
Helwan		89·0	9	23 36	?S	(23 36)	-27	—	—
La Paz		95·1	116	e 16 7	?	—	—	—	—
Kodaikanal		104·1	324	61 54	?L	—	—	(61·9)	—

Additional readings: Tucson gives also eN = +19m.2s. Ann Arbor (Wiechert) MN = +24·5m., ME = +21·1m. Ottawa L = +28·6m., T₀ = 18h.41m.34s. Cheltenham gives SE as PE, also SE = +19m.53s. Stonyhurst P = +19m.54s. Hamburg SR₁ = +23m.36s., MN = +37·6m., T₀ = 18h.41m.23s. De Bilt ePR₁N = +13m.0s., eSR₁N = +23m.28s., T₀ = 18h.41m.28s. Uccle PR₁ = +13m.7s., SR₁ = +23m.36s., MN = +40·6m., T₀ = 18h.41m.28s. Paris gives eS as eL, T₀ = 18h.41m.29s. Strasbourg SN = +20m.6s., T₀ = 18h.41m.28s.

July 7d. 19h. 55m. 40s. Epicentre 20°·0S. 111°·0E.

A = -·337, B = +·877, C = -·342; D = +·934, E = +·358;
G = +·123, H = -·319, K = -·940.

Very uncertain. Compare 1919 Nov. 21d., 22°·0S. 114°·7E.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia		14·4	343	—	—	—	—	e 8·7	15·8
Melbourne		34·3	128	12 20	?S	(12 20)	-24	19·9	22·8
Manila		35·9	17	e 7 20	- 1	—	—	—	—
Riverview		38·1	120	e 9 15	?PR ₁	e 13 39	0	e 17·3	21·9
Honolulu		98·0	70	—	—	—	—	32·8	37·8
Strasbourg		113·6	315	—	—	—	—	—	76·3
De Bilt		115·3	319	—	—	—	—	e 59·3	63·9
Uccle		115·8	319	—	—	—	—	e 59·3	—
Victoria		128·3	40	—	—	—	—	—	50·9
La Paz		143·5	182	e 19 54	[+ 8]	—	—	—	—

Additional readings: Melbourne gives S = +17m.50s., SR₁ = +18m.50s. Riverview MN = +20·0m. De Bilt MN = +64·1m.

July 7d. Readings also at 2h. (Colombo), 6h. (Berkeley), 8h. (Manila), 9h. (Paris, Manila, La Paz, De Bilt, Batavia, and Melbourne), 10h. (Helwan and Riverview), 11h. (Stonyhurst), 12h. (Taihoku), 13h. (La Paz), 16h. (Stonyhurst), 18h. (Mobile), 19h. (Stonyhurst and Barcelona), 20h. (Georgetown), 23h. (Chicago, Ottawa, and Washington).

July 8d. 4h. 39m. 55s. Epicentre $5^{\circ}6'S$. $102^{\circ}0'E$. (as on 1918 Feb. 13d. 2h.).

A = -207, B = +973, C = -098; D = +978, E = +208;

G = +020, H = -095, K = -995.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Batavia	4.8	98	i 1 16	+ 2	i 1 57	-14	i 3.2	4.1
Colombo	25.4	299	12 5	?L	—	—	(12.1)	25.1
Manila	27.6	43	e 5 59	- 5	—	—	—	—
Kodaikanal	29.1	303	24 23	?	—	—	—	—
Taihoku	36.1	31	20 58	?L	—	—	(21.0)	—
Zi-ka-wei	41.2	26	e 8 9	+ 4	e 15 29	+65	—	—
Melbourne	50.5	136	e 15 5	?	—	—	22.4	23.6
Riverview	53.5	129	—	—	e 19 47	?SR ₁	e 23.8	28.4
Helwan	76.3	303	36 5	?L	—	—	(36.1)	—
Vienna	91.3	318	—	—	—	—	e 68.1	—
Hamburg	95.7	323	—	—	—	—	e 66.1	—
De Bilt	98.7	322	—	—	—	—	e 67.1	71.3
La Paz	155.8	204	20 23	[+20]	—	—	—	—

Additional readings and notes: Batavia gives the recorded S and L as i_1 and i_2 .
Helwan PN = +33m.5s. De Bilt e = +57m.47s., eE = +60m.53s., MN = +69.2m.

July 8d. Readings also at 0h. (Chicago, Ottawa, and Washington), 1h. (Cheltenham, Paris, and Ithaca), 2h. (Victoria and Riverview), 9h. (near Algiers), 11h. (Zi-ka-wei), 15h. (San Fernando), 18h. (Taihoku), 19h. (Manila, near Tokyo, and near Batavia), 20h. (Batavia, Taihoku, and Helwan), 22h. (Batavia).

July 9d. Readings at 0h. (Batavia), 1h. (Manila), 2h. (Zante (2)), 9h. (Taihoku), 11h. (Manila, Hokoto, and near Taihoku), 12h. (Colombo), 13h. (Taihoku, Batavia, and Paris), 18h. and 20h. (Paris), 23h. (Batavia and Manila).

July 10d. 15h. 58m. 30s. Epicentre $25^{\circ}0'N$. $68^{\circ}0'E$.

A = +340, B = +840, C = +423; D = +927, E = -375;

G = +158, H = +392, K = -906.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Simla	10.2	51	—	—	e 4 36	+ 1	—	5.7
Kodaikanal	17.3	147	4 12	+ 3	—	—	10.8	13.4
Calcutta	E. 18.8	94	7 54	?S	(7 54)	- 4	10.4	—
	N. 18.8	94	8 0	?S	(8 0)	+ 2	10.3	—
Colombo	21.4	146	8 30	?S	(8 30)	-23	13.5	14.5
Helwan	32.7	284	14 30	?SR ₁	—	—	(16.5)	—
Manila	50.6	90	—	—	—	—	e 31.5	—
Hamburg	51.7	320	—	—	e 16 30	-10	e 31.5	37.3
Moncalieri	51.9	309	—	—	e 16 44	+ 1	32.6	—
Strasbourg	52.1	312	—	—	—	—	—	33.5
De Bilt	54.0	317	—	—	e 17 4	- 5	e 33.5	39.7
Uccle	54.4	316	—	—	e 17 8	- 6	—	34.5
Paris	55.5	313	—	—	e 23 30	?	35.5	35.5
Kew	57.3	317	—	—	—	—	—	39.5
Oxford	58.0	317	—	—	17 51	- 8	—	42.9
Stonyhurst	58.6	318	37 30	?L	—	—	(37.5)	—
Edinburgh	59.0	320	—	—	18 10	- 1	35.5	41.8
Eskdalemuir	59.1	320	—	—	—	—	35.5	—

Additional readings: Hamburg gives also MN = +34.5m. De Bilt MN = +34.8m. Vienna gives a reading at 16h. (no minutes or seconds).

July 10d. Readings also at 0h. (Eskdalemuir, Edinburgh, Uccle, Paris, and De Bilt), 3h. and 4h. (La Paz), 9h. (Batavia and Manila), 10h. (Kodai-kanal), 12h. (near Mizusawa and Tokyo), 19h. (Rocca di Papa), 20h. (Taihoku and Lick (2)), 21h. (Rocca di Papa, Taihoku, and near Tokyo), 22h. (near Tokyo), 23h. (Taihoku and San Fernando).

July 11d. 1h. 30m. 35s. Epicentre $52^{\circ}7'N$, $167^{\circ}0'W$.

A = -590, B = -136, C = +795; D = -225, E = +974;

G = -774, H = -179, K = -606.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Chicago	52.2	69	16 37	?S	(16 37)	- 9	(24.9)	—
Ottawa	56.2	58	e 10 5	+18	i 17 37	+ 1	e 24.9	—
Manila	67.6	268	e 19 53	?S	(e 19 53)	- 4	—	—
Eskdalemuir	71.1	10	11 27	+ 3	20 44	+ 5	34.4	—
Hamburg	73.7	2	e 11 43	+ 3	—	—	—	—
De Bilt	E. 75.0	5	—	—	21 27	+ 1	e 36.4	37.1
	N. 75.0	5	11 51	+ 2	—	—	e 37.4	38.7
Uccle	76.2	6	e 11 56	0	e 21 41	+ 2	e 37.4	39.4
Paris	78.1	8	i 12 7	- 1	e 22 13	+12	39.4	—
Strasbourg	78.6	3	12 8	- 3	e 22 4	- 3	—	43.4
Vienna	E. 79.0	358	i 12 13	0	—	—	—	—
Moncalieri	82.2	4	e 12 32	+ 1	22 44	- 4	34.6	—
Coimbra	85.3	18	—	—	23 11	-11	e 44.8	—
Rocca di Papa	85.5	0	e 12 45	- 6	(i 23 3)	-22	i 23.0	23.3
Tortosa	85.8	10	12 46	- 6	23 11	-17	e 39.4	54.5
Helwan	96.2	346	24 25	?S	(24 25)	-53	—	—

Additional readings: Ottawa gives $i = +19m.33s$.

Helwan PE = +26m.25s.

July 11d. 17h. 27m. 20s. Epicentre $40^{\circ}0'N$, $14^{\circ}0'E$ (as on 1919 Oct. 25d.).

A = +743, B = +185, C = +643.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Pompeii	E. 0.8	0 4	- 8	1 21	+59	—	2.1
Rocca di Papa	2.0	i 0 28	- 3	0 58	+ 3	—	2.4
Padova	5.6	1 11	-16	—	—	—	—
Moncalieri	6.8	e 3 32	?S	(e 3 32)	+27	5.8	—
Vienna	8.4	e 1 40	-27	i 3 30	-17	—	5.0
Strasbourg	9.6	e 2 40	+16	e 5 52	+94	e 6.2	—
Paris	12.0	—	—	e 5 19	0	e 7.3	—
Lemberg	12.1	e 3 16	+16	—	—	—	4.8
Uccle	12.7	—	—	—	—	e 6.7	—
De Bilt	13.5	—	—	e 5 48	- 8	e 8.0	10.1
Hamburg	13.8	—	—	—	—	e 6.7	10.8
Edinburgh	19.5	—	—	7 40	-33	—	—

Additional readings: De Bilt MN = +11.4m.

July 11d. Readings also at 0h. (San Fernando), 8h. (Batavia), 9h. (Strasbourg), 12h. (Helwan), 16h. (Dehra Dun), 20h. (Apia and Manila), 21h. (San Fernando), 22h. (near Oaxaca, near Rocca di Papa (2), and near Tacubaya).

July 12d. 1h. 34m. 28s. Epicentre $34^{\circ}6'N$, $140^{\circ}7'E$. (as on 1919 Aug. 15d.).

A = -637, B = +521, C = +568.

	Δ	P.	O-C.	S.	O-C.	L.	ME.	MN.
	°	m. s.	s.	m. s.	s.	m.	m.	m.
Tokyo	1.3	0 32	+12	—	—	1.3	1.4	—
Osaka	4.3	1 33	+26	—	—	2.6	2.7	2.6
Mizusawa	E. 4.5	0 56	-14	2 6	+ 2	—	—	—
	N. 4.5	1 12	+ 2	2 15	+11	—	—	—
Kobe	4.6	0 32	-39	(1 22)	?P	1.4	1.4	1.6

Tokyo readings have been increased by 1min.

July 12d. Readings also at 2h. (near Osaka and Tokyo), 3h. (near Kobe, Mizusawa (2), Osaka (2), and Tokyo (3)), 4h. (Tokyo (2) and Osaka), 5h. (Tacubaya), 6h. (near Tokyo), 16h. (Uccle), 17h. (Helwan), 18h. (De Bilt), 22h. (San Fernando), 23h. (near Oaxaca and Tacubaya).

July 13d. 8h. 11m. 12s. Epicentre $34^{\circ}6'N$. $140^{\circ}7'E$ (as on July 12d.).

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	ME. m.	MN. m.
Tokyo		1.3	0 20	0	—	—	0.6	1.6	1.6
Osaka		4.3	0 54	-13	—	—	2.1	3.0	2.8
Mizusawa	E.	4.5	1 5	-5	2 8	+ 4	—	—	—
	N.	4.5	1 31	+21	2 38	?L	(2.6)	—	—
Kobe		4.6	1 36	-25	—	—	2.5	3.0	2.9

Kobe gives PSN = +1m.37s.

July 13d. Readings also at 6h. (La Paz), 7h. (Helwan), 9h. (Paris), 11h. (near Pompeii and Rocca di Papa), 13h. (Zi-ka-wei, Manila, near Tokyo, and near Taihoku (2)), 14h. (Strasbourg and De Bilt), 19h. (La Paz), 21h. (San Fernando).

July 14d. Readings at 7h. (Zi-ka-wei), 8h. (De Bilt), 10h. (Taihoku), 11h. (near Mizusawa and Tokyo), 14h. (Florence, Helwan, and near Tokyo), 21h. (Lick), 23h. (Taihoku and San Fernando).

July 15d. Readings at 0h. (near Tacubaya), 1h. (Riverview and Manila), 2h. (Uccle, De Bilt, and Helwan), 4h. (Nagasaki), 8h. (Florence and Cape Town), 11h. (Riverview), 14h. (La Paz, and near Tacubaya), 17h. (La Paz), 20h. (Taihoku), 21h. (San Fernando and Manila), 23h. (Lick).

1920. July 16d. 17h. 14m. 15s. Epicentre $6^{\circ}0'N$. $84^{\circ}0'W$.

A = +.104, B = -.989, C = +.104; D = -.994, E = -.104;
G = +.011, H = -.104, K = -.994.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Balboa Heights		5.3	56	1 28	+ 6	2 20	- 5	2.6	3.0
La Paz		27.4	145	1 6 34	+32	11 57	+69	15.6	20.1
Washington		33.5	10	6 21	-40	12 15	-17	18.1	—
Chicago		35.9	356	7 42	+21	12 50	-19	20.7	—
Ann Arbor	E.	36.4	1	9 33	+128	14 3	+47	18.0	—
Toronto		37.9	6	—	—	—	—	18.4	19.6
Ottawa	E.	40.1	10	8 39	+43	14 15	+ 7	18.4	—
Point Loma		40.9	317	—	—	—	—	—	45.7
Victoria		54.0	330	23 18	?SR ₁	—	—	—	35.8
Coimbra		75.2	50	—	—	—	—	e 33.7	—
Rio Tinto		76.3	52	29 45	?	—	—	—	58.7
Edinburgh		79.7	35	—	—	21 45	-35	—	43.7
Stonyhurst		80.2	38	22 57	?S	(22 57)	+32	41.4	43.8
Oxford		80.8	40	—	—	—	—	—	43.2
Paris		83.4	41	1 12 25	-13	—	—	37.7	43.7
Uccle		84.4	40	e 12 30	-14	e 22 39	-33	—	41.8
De Bilt		84.8	39	12 32	-15	22 43	-34	e 39.7	44.7
Strasbourg		86.9	42	—	—	—	—	—	41.7
Moncalieri		87.0	45	e 17 9	?PR ₁	29 24	?SR ₁	42.9	—
Hamburg		87.4	36	e 12 48	-13	—	—	e 39.7	51.7
Rocca di Papa		91.0	48	e 13 5	-16	—	—	e 23.5	23.9
Vienna		92.5	40	c 13 9	-21	—	—	44.7	—
Helwan		108.5	56	59 45	?L	—	—	(59.6)	—

Additional readings: For Balboa Heights the mean of the N and E components is entered in the table. $T_0 = 17h.14m.37s$. Ann Arbor gives also LN = +18.4m. These two L's are assumed 10min. in error. Toronto L? = +49.2m. Ottawa LE = +29.8m., $T_0 = 17h.15m.54s$. Stonyhurst S = +30m.45s. De Bilt MN = +44.3m., $T_0 = 17h.14m.34s$. Hamburg MN = +48.8m. Rocca di Papa iE = +13m.9s., iN = +13m.12s. Helwan PE = +65m.45s.

July 16d. Readings also at 10h. (near Nagasaki), 14h. (Hamburg, De Bilt, Helwan, and Tacubaya), 18h. (Strasbourg), 19h. (near Tokyo), 20h. (La Paz), 21h. (San Fernando).

July 17d. Readings at 0h. (Moncalieri), 4h. (La Paz), 6h. (near Lick), 11h. (La Paz), 14h. (Uccle), 17h. and 19h. (Taihoku), 23h. (San Fernando).

July 18d. 22h. 27m. 35s. Epicentre $46^{\circ}0'N$. $152^{\circ}5'E$. (as on 1913 Jan. 19d.).

A = -·616, B = +·321, C = +·719; D = +·462, E = +·887;
G = -·638, H = +·332, K = -·695.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	10·8	235	2 42	+ 1	4 49	- 1	—	—
	N.	10·8	235	2 56	+ 15	4 48	- 2	—	—
Eskdalemuir		76·6	344	—	—	—	—	43·4	—
De Bilt		78·0	340	—	—	c 22 0	0	e 41·4	51·0
Uccle		79·4	340	—	—	—	—	e 41·4	—
Strasbourg		80·5	334	—	—	—	—	—	52·4
Moncalieri		83·9	333	—	—	c 38 24	?	49·3	—
Rocca di Papa		85·2	331	i 12 47	- 2	—	—	e 53·4	55·6
Helwan		87·3	309	57 25	?L	—	—	(57·4)	—
San Fernando		95·3	340	58 25	?L	—	—	(58·4)	—

Additional readings: De Bilt MN = +50·8m. Rocca di Papa cPE = +12m.55s. Helwan PN = +55m.25s.

July 18d. Readings also at 3h. (Mauritius), 7h. (near Athens), 11h. (Batavia), 12h. (near Batavia and near Mizusawa), 15h. (near Tokyo), 16h. (La Paz).

July 19d. Readings at 3h. (near Manila), 15h. (La Paz, Taihoku, and near Balboa Heights), 16h. (Zi-ka-wei and near Taihoku).

July 20d. 0h. 21m. 35s. Epicentre $50^{\circ}0'S$. $127^{\circ}0'W$.

A = -·387, B = -·513, C = -·766; D = -·799, E = +·602;
G = +·461, H = +·612, K = -·643.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Apia		51·2	299	—	—	—	—	25·4	—
La Paz		57·6	76	i 9 56	0	17 53	- 1	26·1	27·9
Riverview		59·8	252	—	—	e 18 43	+ 22	e 28·2	31·6
Sydney		59·8	252	11 43	+ 92	—	—	28·9	32·0
Melbourne		60·9	243	—	—	—	—	e 26·4	32·4
Honolulu		76·5	330	e 34 25	?L	—	—	38·4	43·4
Chicago		98·0	28	—	—	—	—	e 46·9	—
Victoria		98·4	2	48 1	?L	—	—	50·6	51·6
Stonyhurst		146·5	63	71 25	?L	—	—	81·4	84·4
Eskdalemuir		146·5	60	—	—	—	—	77·4	—
Edinburgh		146·6	60	—	—	—	—	75·4	—
Paris		147·8	73	e 19 40	[-13]	—	—	75·4	—
Moncalieri		149·5	82	e 21 12	?	35 42	?	62·4	—
Uccle		149·6	70	e 19 43	[-12]	—	—	e 64·4	86·4
De Bilt		150·4	67	—	—	—	—	e 76·4	77·8
Strasbourg		150·9	74	e 19 45	[-12]	—	—	—	—
Rocca di Papa		151·2	91	e 19 43	[-14]	—	—	—	29·3
Pompeii		151·8	94	19 34	[-25]	—	—	—	—
Hamburg		153·6	65	—	—	e 34 25	?	e 78·4	—
Helwan		154·1	133	75 25	?L	—	—	(75·4)	—

Additional readings: De Bilt gives MN = +80·8m. Helwan PN = +65m.25s.

July 20d. 3h. 59m. 30s. Epicentre $34^{\circ}0'N$. $14^{\circ}0'E$.

A = +·804, B = +·201, C = +·559; D = +·242, E = -·970;
G = +·543, H = +·135, K = -·829.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Pompeii	E.	6·8	3	1 44	0	3 4	- 1	—	3·9
Rocca di Papa		7·8	353	i 2 7	+ 9	3 37	+ 6	i 3·9	4·4
Moncalieri		12·0	338	e 3 34	+ 35	—	—	7·3	—
Strasbourg		15·3	344	e 3 33	- 10	e 6 29	- 10	—	—
Paris		17·1	334	e 4 14	+ 8	—	—	—	—
Uccle		18·2	340	e 4 14	- 5	e 7 42	- 2	—	—
De Bilt		19·2	343	—	—	e 7 49	- 17	—	11·7

Zante gives a reading at 4h. simply. Strasbourg gives eN = +6m.28s.,
 $T_0 = 3h.59m.27s.$

July 20d. 12h. 18m. 30s. Epicentre $33^{\circ}8'N$. $140^{\circ}5'E$.

$$A = -.641, B = +.528, C = +.556; \quad D = +.636, E = +.772; \\ G = -.429, H = +.354, K = -.831.$$

A depth of focus 0.010 is suggested.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo		+0.2	2.0	342	0 32	- 2	—	1.0	1.4
Osaka		0.0	4.3	284	1 2	- 5	—	2.2	4.0
Kobe	E.	0.0	4.5	285	1 9	- 1	—	2.4	3.2
	N.	0.0	4.5	285	1 10	0	—	—	2.4
Mizusawa	E.	0.0	5.3	5	1 23	+ 1	2 26	+ 1	—
	N.	0.0	5.3	5	1 25	+ 3	2 30	+ 5	—
Ootomari		-0.2	13.0	7	1 3	?	—	—	—
Zi-ka-wei		-0.2	16.3	266	e 3 46	- 7	—	—	—
Taihoku		-0.4	18.7	247	e 3 59	-22	—	—	—
Manila		-0.5	26.1	227	e 6 30	+46	—	—	—
Honolulu		-1.1	55.0	86	—	—	—	33.0	—
Hamburg		-1.4	82.7	333	—	—	e 21 30	-68	—
Vienna		-1.4	84.0	328	—	—	e 22 42	-11	23.5
Moncalieri		-1.4	90.4	329	e 23 26	? S	(e 23 26)	-37	43.4
La Paz		—	149.0	63	19 44	[-10]	—	—	—

Osaka gives also MN = +4.1m.

Moncalieri S? = +31m.30s.

July 20d. Readings also at 0h. (San Fernando), 3h. (Coimbra), 4h. (near La Paz), 5h. (Coimbra, Chicago, Honolulu, and near Rocca di Papa), 6h. (Eskdalemuir, Uccle, Helwan, Edinburgh, De Bilt, and Strasbourg), 7h. (Helwan), 9h. (near Osaka, Tokyo, and Mizusawa), 11h. (Pompeii), 20h. (Taihoku), 21h. (San Fernando), 23h. (Batavia).

July 21d. 14h. 29m. 5s. Epicentre $34^{\circ}4'N$. $27^{\circ}0'E$.

$$A = +.735, B = +.375, C = +.565; \quad D = +.454, E = -.891; \\ G = +.503, H = +.256, K = -.825.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	4.4	325	1 18	+10	2 10	—	2.3	3.2
Helwan	5.8	140	2 55	?L	—	+ 9	(2.9)	—
Pompeii	11.8	306	3 34	+38	8 14	?	—	—
Rocca di Papa	13.4	307	e 3 16	- 2	—	—	e 6.9	9.9
Florence	15.4	312	7 55	?L	—	—	(7.9)	9.9
Lemberg	15.6	353	e 6 55	?S	(e 6 55)	- 9	9.9	11.4
Padova	15.9	318	1 33	?	5 52	?	—	—
Vienna	16.0	333	e 3 56	+ 4	—	—	e 10.1	10.8
Moncalieri	18.2	311	4 23	+ 4	8 38	+54	10.4	14.2
Zurich	19.0	319	e 4 28	- 1	—	—	—	—
Algiers	19.6	284	e 4 36	0	—	—	—	8.5
Strasbourg	20.1	321	4 43	+ 1	8 30	+ 5	10.9	—
Besançon	20.3	315	4 44	- 1	8 48	+19	12.9	—
Tortosa	21.9	295	4 55	- 9	8 58	- 5	9.4	9.6
Hamburg	22.6	333	e 5 7	- 5	e 10 15	+58	e 13.3	18.1
Paris	23.1	316	e 5 17	- 1	e 9 21	- 6	12.9	13.9
Uccle	23.2	322	e 5 16	- 3	e 9 24	- 5	e 12.9	—
De Bilt	23.6	325	—	—	e 9 39	+ 3	e 12.9	16.0
Granada	24.9	285	5 38	+ 1	9 59	- 2	—	—
Oxford	26.7	319	—	—	10 26	- 9	—	—
Eskdalemuir	29.5	324	—	—	10 55	-31	—	—
Edinburgh	29.8	325	—	—	12 55	+84	—	—
Cape Town	68.8	188	19 3	?S	(19 3)	-69	—	38.9

Additional readings and notes: Athens gives also iP = +1m.21s., T_0 = 14h.29m.18s. Helwan PN = 14h.29m. Vienna gives its records as at 15h. instead of 14h. Moncalieri MN = +11.9m. Hamburg MN = +19.3m. Uccle i = +9m.33s., T_0 = 14h.29m.10s. De Bilt MN = +13.7m.

July 21d. Readings also at 1h. (Lick), 5h. (Colombo), 6h. (San Fernando and near Rocca di Papa), 14h. (Rocca di Papa), 20h. (Apia), 21h. (San Fernando (2)), 22h. (Taihoku), 23h. (near Tokyo).

July 22d. Readings at 0h., 1h., and 16h. (Lick), 18h. (near Rocca di Papa and Pompeii), 20h. (Pompeii, Adelaide, Riverview, and Melbourne), 21h. (Apia, Paris, and Helwan).

July 23d. Readings at 4h. (Apia), 7h. (La Paz), 14h. (near Tokyo), 17h. (Manila), 19h. (near Tacubaya), 22h. (Ootomari).

July 24d. Readings at 0h. (San Fernando), 4h. (La Paz and near Tokyo and Mizusawa), 5h. (La Paz), 7h. (Melbourne, Riverview, and Tacubaya), 9h. (near Mizusawa), 11h. (Helwan), 12h. (Strasbourg), 16h. (Taihoku), 19h. (Rio Tinto), 21h. (San Fernando).

July 25d. Readings at 4h. (Riverview), 5h. (Melbourne), 7h. (Riverview and La Paz), 12h. (La Paz and Mizusawa), 13h. (Chicago and near Tacubaya), 15h. (near Tacubaya), 18h. (La Paz and near Tokyo), 20h. (near Mizusawa (2) and near Tacubaya), 22h. (San Fernando).

July 26d. 5h. 12m. 35s. Epicentre $32^{\circ}7'S$. $73^{\circ}7'W$.

$A = +.236$, $B = -.808$, $C = -.540$; $D = -.960$, $E = -.281$;

$G = -.152$, $H = +.519$, $K = -.842$.

The residuals for $\Delta > 90^{\circ}$ suggest a deep focus; but the evidence scarcely suffices for a solution on those lines.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
La Paz	16.9	19	i 4 7	+ 3	7 12	- 4	8.2	9.6
Georgetown	71.6	358	e 11 23	- 4	20 42	- 3	—	—
Washington	71.6	358	11 22	- 5	20 40	- 5	—	—
Cape Town	74.1	120	21 11	?S	(21 11)	- 4	—	21.8
Chicago	75.5	350	11 45	- 7	21 20	-12	37.8	—
Ann Arbor	75.5	354	8 25	?	15 49	?PR ₁	26.0	—
Toronto	76.5	356	—	—	—	—	i 16.6	17.9
Ottawa	78.1	359	—	—	e 22 5	+ 4	—	—
Victoria	92.4	330	23 29	?S	(23 29)	-70	44.1	50.0
Coimbra	93.5	44	16 55	?	23 39	-72	e 35.4	—
Algiers	99.8	52	24 3	?S	(24 3)	-111	42.4	55.4
Oxford	105.5	39	—	—	24 32	-135	—	—
Kew	105.8	39	—	—	—	—	—	51.4
Paris	105.9	42	—	—	e 24 36	-135	53.4	59.4
Stonyhurst	106.0	38	24 49	?S	(24 49)	-123	—	63.4
Eskdalemuir	106.5	35	—	—	e 24 40	-137	47.4	—
Edinburgh	106.9	35	—	—	24 25	-155	—	—
Moncalieri	107.0	48	e 19 11	?PR ₁	24 36	-145	27.9	—
Uccle	108.0	41	17 25	?	—	—	—	—
Strasbourg	108.8	45	—	—	e 25 25	-112	e 34.4	—
De Bilt	109.0	40	—	—	e 24 50	-149	e 45.4	61.2
Pompeii	109.5	53	19 8	?PR ₁	—	—	—	—
Hamburg	112.3	40	—	—	e 24 25	-203	e 47.4	—
Helwan	117.3	70	26 25	?S	(26 25)	-123	—	—

Additional readings: Ann Arbor gives PN = +8m.1s., LN = +25.6m. Toronto L? = +4.9m. Coimbra i = +25m.25s. De Bilt ePR₁ = +19m.12s., MN = +61.6m.

July 26d. Readings also at 7h. (Taihoku), 9h. (Stonyhurst), 10h. (Batavia and Stonyhurst), 13h. (near Tacubaya and near Manila), 14h. (near Manila), 15h. (near Mizusawa), 16h. (Rocca di Papa, Algiers, and near Mizusawa), 17h. (Taihoku and near Algiers), 20h. (Batavia), 21h. (Batavia, Lick, and Manila), 22h. (Helwan).

July 27d. Readings at 0h. (San Fernando), 3h. (Manila), 12h. (near Tokyo), 17h. (near Lick).

July 28d. Readings at 0h. (San Fernando and Chicago), 1h. (Paris and Helwan), 2h. (La Paz and near Mizusawa and Tokyo), 3h. (Tortosa and near Mizusawa and Tokyo), 4h. (near Kobe), 5h. and 6h. (La Paz), 7h. (Florence), 12h. (De Bilt, La Paz, and Simla), 15h. (La Paz and near Tacubaya), 17h. (Taihoku (2)), 19h. (Apia), 20h. (Rio Tinto), 21h. (near Oaxaca and Tacubaya), 23h. (Batavia and Manila).

July 29d. Readings at 0h. (Helwan and San Fernando), 1h. (2) and 7h. (Stonyhurst), 9h. (near Tokyo), 11h. (near Tacubaya), 13h. (Helwan and near Rocca di Papa), 14h. (Stonyhurst), 15h. (Stonyhurst and near Tokyo), 16h. (Stonyhurst), 22h. (San Fernando), 23h. (Stonyhurst).

July 30d. 20h. 6m. 20s. Epicentre $45^{\circ}0'N$. $16^{\circ}0'E$. (as on 1916 Mar. 12d.).

$A = +.680$, $B = +.195$, $C = +.707$; $D = +.276$, $E = -.961$;

$G = +.679$, $H = +.195$, $K = -.707$.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Padova	2.9	277	0 42	- 3	1 56	?L	(1.9)	—
Vienna	3.3	4	i 0 50	- 2	i 1 29	- 2	—	2.0
Florence	3.6	252	1 40	?8	(1 40)	+ 1	—	2.6
Rocca di Papa	4.0	218	i 1 16	+14	1 41	- 9	e 2.2	3.6
Pompeii	4.3	195	1 42	?8	(1 42)	-16	(2.7)	—
Zurich	E.	5.6	e 1 19	- 8	i 2 37	+ 3	—	2.7
N.	5.6	298	e 1 24	- 3	i 2 36	+ 2	—	—
V.	5.6	298	e 1 27?	0	i 2 37	+ 3	—	2.7
Moncalieri	5.8	271	e 1 4	-26	2 54	+15	3.8	—
Strasbourg	6.7	305	1 53	+11	3 16	+14	3.5	—
Besançon	7.3	291	2 37	+46	3 36	+18	3.7	—
Hamburg	9.4	338	—	—	—	—	e 4.7	6.1
Uccle	9.7	311	e 4 22	?8	(e 4 22)	+ 1	—	—
Paris	10.0	298	e 4 8	?8	(e 4 8)	-21	5.1	—
De Bilt	10.1	319	—	—	—	—	e 5.1	—

Additional readings: Vienna gives MN $+2.1m.$, MZ $+1.9m.$ Hamburg
 MN $+7.0m.$ Paris eS $+4m.55s.$

July 30d. Readings also at 0h. (Taihoku), 3h. (near Algiers), 7h. (La Paz and near Tokyo), 16h. (Stonyhurst), 17h. (Taihoku), 20h. (San Fernando).

July 31d. Readings at 1h. (La Paz), 7h. (near Mizusawa), 14h. (near Tokyo), 18h. (Rio Tinto and Mizusawa), 20h. (Taihoku), 23h. (San Fernando).

Aug. 1d. Readings at 0h. (Rio Tinto), 2h. (near Tacubaya), 7h. and 13h. (La Paz), 22h. (Manila), 23h. (La Paz).

Aug. 2d. Readings at 0h. (Tortosa, Uccle, San Fernando, Helwan, and De Bilt), 1h. (Rio Tinto), 5h. (Manila, Riverview, La Paz, Adelaide (2), and Melbourne), 6h. (De Bilt, Chicago, and Kodaikanal), 7h. (Kodaikanal, La Paz, Vienna, Hamburg, and Simla), 12h. (La Paz), 13h. (Taihoku and Manila), 14h. (La Paz), 17h. (Manila), 18h. (near Tacubaya), 19h. (Rio Tinto), 20h. (Taihoku, Riverview, and Melbourne), 21h. (La Paz).

1920. Aug. 3d. 3h. 2m. 15s. Epicentre 6°5N. 128°0E.

(as on 1920 Mar. 12d.).

A = -·612, B = +·783, C = +·113; D = +·788, E = +·616;
G = -·070, H = +·089, K = -·994.

A depth of focus 0·040 is adopted for this earthquake. This is greater than the La Paz reading would suggest, but at least this amount is required to bring the stations near the origin into agreement and a greater depth would suit them better.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Manila		-0·6	10·7	320	e 2 21	-10	i 4 0	i 4·3	4·7
Taihoku		-1·6	19·5	342	4 26	+10	—	8·2	—
Batavia		-2·1	24·7	239	e 5 5	-7	8 52	-25	16·8
Zi-ka-wei		-2·1	25·5	346	e 5 14	-7	9 32	-1	—
Tokyo		-2·7	31·1	19	e 7 19	+67	—	—	13·5
Mizusawa	E.	-3·0	34·7	17	6 41	-3	12 9	+6	—
	N.	-3·0	34·7	17	6 41	-3	11 46	-17	—
Adelaide		-3·5	42·6	167	e 9 21	? PR ₁	13 51	-2	17·2
Riverview		-3·7	45·9	151	e 8 3	-9	i 14 37	-1	e 22·6
Sydney		-3·7	45·9	151	—	—	18 9	? SR ₁	23·2
Melbourne		-3·8	47·0	161	—	—	15 15	+24	18·8
Colombo		-3·8	47·8	274	7 57	-29	10 9	? PR ₁	15·4
Mauritius		-5·0	73·8	247	21 45	? S	(21 45)	+93	—
Helwan		-5·5	92·6	301	17 45	? PR ₁	—	—	—
Victoria		-5·7	97·2	39	16 27	? 2	24 19	-10	39·1
Vienna		-5·7	99·2	322	i 13 22	-13	23 46	-65	39·8
Hamburg		-5·7	100·8	329	e 13 30	-14	i 24 0	-67	e 49·8
Pompeii	E.	-5·9	103·1	315	17 6	? PR ₁	24 6	-82	—
Padova		-5·9	103·1	320	17 35	? PR ₁	24 25	-63	—
De Bilt	E.	-5·9	104·0	329	—	—	e 24 14	-83	e 51·8
	N.	-5·9	104·0	329	—	—	e 24 55	-42	e 50·8
Rocca di Papa	N.	-5·9	104·0	317	e 18 13	? PR ₁	e 25 49	+12	56·0
Strasbourg		-6·0	104·3	323	e 17 44	[-18]	e 28 15	+156	e 49·8
Ucle		-6·0	105·1	327	—	—	24 18	-89	e 47·8
Moncalieri		-6·0	105·9	321	12 12	-118	24 51	-64	52·2
Eskdalemuir		-6·1	106·3	336	18 10	[+1]	26 21	+23	37·8
Stonyhurst		-6·2	106·8	331	19 3	? PR ₁	—	—	59·2
Paris		-6·2	107·1	327	—	—	i 24 31	-93	50·8
Kew		-6·2	107·2	330	—	—	—	—	70·8
Oxford		-6·2	107·5	330	17 43	[-30]	24 30	-98	53·0
Cape Town		-6·3	109·8	236	17 26	[-55]	—	—	29·3
Tortosa		-6·4	112·5	320	18 53	[+23]	28 15	+82	39·0
Algiers		-6·5	112·8	315	e 18 36	[+5]	(29 15)	+140	29·2
Coimbra		-6·8	118·5	322	17 47	[-61]	24 59	-164	e 37·8
San Fernando	E.	-6·9	119·4	318	69 45	? L	—	—	(69·8)
	N.	-6·9	119·4	318	22 45	? PR ₁	—	—	85·8
Chicago		—	121·8	30	19 7	[+10]	29 37	+34	e 50·4
Ottawa		—	123·9	18	e 20 49	? PR ₁	—	—	—
Toronto		—	124·1	21	(18 33)	[-30]	—	—	18·6
Georgetown		—	129·0	23	e 21 45	? PR ₁	—	—	—
Washington		—	129·0	23	18 53	[-23]	22 0	? PR ₁	—
La Paz		—	161·3	124	i 19 51	[-18]	i 31 2	? 51·0	—

Additional readings and notes: Manila gives MN = +4·6m., T₀ = 3h.2m.35s.
Zi-ka-wei PSN = +9m.54s., SR₁E = +10m.52s., T₀ = 3h.2m.4s. Tokyo
MN = +13·0m. Riverview PS = +15m.24s., iSR₁E = +17m.58s. and
+18m.12s., MN = +24·6m., MZ = +24·1m., T₀ = 3h.2m.1s. Helwan PN
= +18m.45s. Hamburg MN = +51·8m. Rocca di Papa gives P =
+18m.1s., S = +24m.10s., perhaps intended as a local shock. Also eLN =
+33·0m., LN = +62·0m. Strasbourg PR₁E = +24m.14s., eSN = +
+28m.29s. Mauritius PE = +16m.45s., ME = +22·2m. Eskdalemuir
gives its records as at 4h. Coimbra S = +28m.17s., LN = +43·8m.
Chicago PR₁ = +24m.52s., L = +67·8m. La Paz i = +45m.39s.

1920. Aug. 3d. 19h. 57m. 10s. Epicentre 27°·6S. 66°·3W.

(Close to Andalgala).

A = +·356, B = -·811, C = -·463, ; D = -·916, E = -·402 ;

G = -·186, H = +·424, K = -·886.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz		11·2	350	i 2 44	- 3	4 56	- 3	5·8	6·4
Rio de Janeiro	E.	21·4	83	i 4 44	-14	8 41	-12	(10·9)	12·2
	N.	21·4	83	i 4 44	-14	8 50	- 3	10·8	12·3
Balboa Heights	E.	38·8	339	—	—	13 26	-23	—	25·9
	N.	38·8	339	7 28	-16	13 20	-29	—	26·6
Porto Rico	E.	45·8	0	—	—	15 3	-22	23·1	25·1
	N.	45·8	0	—	—	e 14 56	-29	e 24·6	29·2
Tacubaya		56·7	322	9 58	+ 8	17 40	- 2	24·4	27·6
Cheltenham	E.	67·1	351	11 0	+ 1	19 49	- 2	—	—
	N.	67·1	351	10 55	- 4	19 39	-12	34·4	41·0
Georgetown	E.N.	67·2	351	e 11 1	+ 2	20 1	+ 9	e 31·0	—
Washington		67·2	351	10 58	- 1	19 48	- 4	34·4	—
Harvard	N.	70·1	356	11 15	- 3	20 23	- 4	e 34·4	38·8
Cape Town		71·0	118	21 12	?S	(21 12)	+34	38·9	44·9
Accra		71·7	73	8 50	—	—	—	—	33·3
Ann Arbor	E.	71·7	348	9 50	-98	20 38	- 8	33·0	41·5
	N.	71·7	348	10 2	-86	20 44	- 2	32·6	41·0
Northfield		72·0	355	—	—	—	—	39·3	—
Chicago		72·1	344	10 50	-41	19 55	-56	31·8	—
Toronto		72·3	350	9 26	? i 22 2	—	+68	e 36·1	50·3
Tucson	E.	73·3	322	e 11 58	+20	e 20 19	-47	31·3	33·6
	N.	73·3	322	e 12 34	+56	e 21 51	+45	—	—
Ottawa		73·4	354	11 38	0	21 5	- 2	e 34·3	—
Berkeley		83·9	320	e 12 31	-10	(22 50)	-18	22·8	—
San Fernando		85·4	44	12 50	0	23 32	+ 9	—	64·3
Coimbra	E.	86·5	40	12 59	+ 3	23 33	- 3	e 36·4	50·3
	N.	86·5	40	—	—	23 31	- 5	38·5	50·7
Granada		87·4	45	13 2	+ 1	23 47	+ 2	—	—
Victoria		91·5	327	23 32	?S	(23 32)	-57	37·3	44·2
Algiers		91·6	48	13 21	- 4	24 3	-28	40·8	46·3
Tortosa		92·2	43	13 25	- 3	24 9	-28	37·7	56·9
Barcelona		93·6	44	—	—	i 24 48	- 4	e 43·3	56·0
Oxford		97·6	35	17 53	?PR ₁	23 33	-119	59·5	—
Paris		97·9	38	e 13 50	- 9	i 24 32	-63	46·8	52·8
Kew		97·9	35	54 50	?L	—	—	(54·8)	57·8
Stonyhurst		98·2	34	i 24 38	?S	(i 24 38)	-60	52·6	58·5
Eskdalemuir		98·7	30	18 3	?PR ₁	24 33	-70	—	53·8
Moncalieri		98·9	43	14 5	0	24 36	-69	39·8	59·8
Besançon		99·0	41	—	—	24 47	-59	52·8	—
Uccle		100·0	38	—	—	24 41	-75	42·8	53·2
Dyce		100·4	29	13 0	-73	24 50	-70	30·3	53·7
Florence		100·5	46	24 50	?S	(24 50)	-71	—	(59·8)
Rocca di Papa		100·5	48	e 14 7	- 6	e 24 49	-72	e 54·0	—
	N.	100·5	48	e 14 13	0	e 24 53	-68	e 41·9	69·1
Zurich		100·6	42	—	—	e 24 50	-71	e 50·8	—
Strasbourg		100·7	41	e 16 50	? i	24 51	-71	e 47·8	59·0
Pompeii		101·0	50	17 50	?PR ₁	—	—	—	—
De Bilt	E.	101·1	37	—	—	e 24 55	-71	e 46·8	57·7
	N.	101·1	37	—	—	e 24 56	-70	—	57·5
Honolulu		101·2	289	—	—	25 26	-41	48·6	53·1
Padova		101·6	44	13 20	-58	24 51	-80	51·4	61·4
Hamburg		104·3	37	e 17 50	?PR ₁	e 25 4	-92	e 50·8	60·2
Vienna		105·7	43	e 18 38	?PR ₁	25 12	-97	—	63·8
Athens		106·6	55	e 20 28	?PR ₁	i 26 30	-27	e 45·8	61·4
Melbourne		108·4	206	—	—	—	—	55·0	56·0
Riverview		109·1	212	e 25 16	?S	(e 25 16)	-124	e 49·4	52·0
Helwan	E.	109·4	66	20 56	?PR ₁	—	—	—	69·6
	N.	109·4	66	24 56	?S	(24 56)	-147	—	68·8
Adelaide		113·2	202	—	—	—	—	—	68·1
Colombo		141·8	116	54 14	? i	73 26	?L	79·6	85·6
Batavia		145·6	168	i 19 56	[+ 7]	—	—	e 72·4	84·9
Simla		148·1	75	—	—	—	—	e 74·4	92·0
Manila		165·3	208	e 20 34	[+ 22]	—	—	—	—
Zi-ka-wei		172·4	300	—	—	e 45 50	?SR ₁	—	101·9
Taihoku		172·6	252	—	—	e 33 48	? i	—	—

For Notes see next page.

NOTES TO AUG. 3d. 19h. 57m. 10s.

Additional readings and notes: Rio de Janeiro gives also $PR_1E = +4m.50s.$, $PSN = +7m.8s.$, $SR_1N = +9m.8s.$, $SR_1E = +9m.14s.$, $T_0 = 19h.56m.57s.$, SR_2E is assumed to be LE by comparison with the recorded LN. Porto Rico $PR_1 = +10m.2s.$, $SR_1E = +18m.23s.$, $SR_1N = +18m.40s.$ Washington LE = $+31.8m.$, L = $+38.8m.$ and $-47.8m.$, $T_0 = 19h.57m.19s.$ Cape Town S = $+30m.54s.$ (? SR_1). Toronto iP? = $-14m.14s.$, eL = $-45.3m.$, $+58.4m.$ and $+74.0m.$ Ottawa L = $+42.8m.$ and $+53.8m.$, $T_0 = 19h.57m.20s.$ Berkeley eLN = $-22.9m.$ (?eSN). San Fernando MN = $-54.3m.$ Coimbra $PR_1N = +15m.50s.$, iS = $+23m.47s.$, iSE = $+23m.55s.$, $T_0 = 19h.57m.35s.$ Victoria S? = $-28m.57s.$ (? SR_1). Paris MN = $-54.8m.$, $T_0 = 19h.58m.15s.$ Moncalieri MN = $+58.3m.$ Uccle MN = $+56.1m.$ Florence—one hour has been deducted from the readings. Rocca di Papa gives two sets of records; for the first we also have L = $-78.3m.$ and for the second L = $+46.0m.$, and LN = $+56.4m.$ Strasbourg MN = $+63.7m.$ De Bilt e $PR_1 = +18m.2s.$ Honolulu record at $+42m.38s.$ Hamburg eL also at $+43.8m.$, MN = $+61.9m.$ Athens iE = $+25m.22s.$, MN = $+62.3m.$ Riverview eS = $+34m.29s.$ (? SR_1). Batavia eE = $+42m.36s.$ eLE = $+105.5m.$ Zi-ka-wei MN = $+106.4m.$ These observations of M have been increased by 1 hour to accord with the observations of S.

Aug. 3d. Readings also at 0h. (Manila), 2h. (Taihoku), 4h. (Taihoku and Zi-ka-wei), 5h. (Taihoku (2), Manila, Zi-ka-wei, and Mizusawa), 6h. (De Bilt), 8h. and 13h. (2), and 14h. (La Paz), 19h. (Stonyhurst), 21h. (5), 22h., and 23h. (La Paz).

Aug. 4d. Readings at 0h. (San Fernando), 1h. (Moncalieri), 2h. (De Bilt, Helwan, and Paris), 3h. (La Paz), 4h. (Kobe), 6h. (near Mizusawa), 12h. (La Paz), 18h. (near Rocca di Papa and Pompeii), 19h. (near Rocca di Papa), 23h. (San Fernando).

Aug. 5d. 19h. 1m. 44s. Epicentre $21^\circ 1'N$, $121^\circ 7'E$. (as on 1919 May 4d.).

A = -490 , B = $+794$, C = $+360$; D = $+851$, E = $+526$;
G = -189 , H = $+306$, K = -933 .

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^\circ$	$^\circ$	m. s.	s.	m. s.	s.	m.	m.
Hokoto	3.1	321	0 53	+ 4	—	—	1.1	—
Taihoku	3.9	0	1 3	+ 2	—	—	1.5	—
Manila	6.5	186	—	—	3 6	+ 9	8.1	9.2
Zi-ka-wei	10.1	359	e 2 25	- 6	e 4 31	- 1	—	5.4
Colombo	42.9	257	29 16	?L	—	—	(29.3)	—
Helwan	79.9	298	51 16	?	—	—	—	—
Vienna	84.0	321	—	—	—	—	e 42.3	51.3
Hamburg	85.1	326	—	—	—	—	e 43.3	51.3
De Bilt	88.4	327	—	—	—	—	e 47.3	48.4
Strasbourg	88.9	323	—	—	—	—	e 48.3	—
Uccle	89.5	326	—	—	—	—	e 46.3	—
Eskdalemuir	90.4	333	—	—	—	—	43.3	—
Moncalieri	90.8	320	—	—	e 46 43	?L	50.3	—
Stonyhurst	91.1	331	—	—	—	—	49.8	52.3
Kew	91.5	328	—	—	—	—	—	55.3
Tortosa	97.4	319	—	—	—	—	e 51.3	—
San Fernando	104.3	319	57 16	?L	—	—	(57.3)	—

Additional readings: Manila gives MN = $+8.9m.$ Zi-ka-wei MN = $+6.9m.$,
 $T_0 = 19h.1m.35s.$ Helwan PN = $+46m.16s.$ De Bilt MN = $+48.2m.$

Aug. 5d. Readings also at 4h. (Barcelona), 11h. (La Paz), 14h. (Taihoku), 17h. and 19h. (Taihoku).

Aug. 6d. Readings at 0h. and 8h. (La Paz), 15h. (Apia and La Paz), 18h. (near Tokyo, Osaka, and Mizusawa), 19h. (Taihoku), 20h. (Manila), 21h. (Taihoku), 22h. (Apia), 23h. (Manila and Taihoku).

Aug. 7d. Readings also at 0h. (De Bilt), 1h. (San Fernando), 2h. (Vicques and La Paz), 6h. (Tacubaya), 9h. and 10h. (La Paz), 11h. (near Tacubaya and Oaxaca), 13h. (near Oaxaca), 17h. (2) and 18h. (3) (La Paz), 19h. (Helwan), 21h. (Taihoku).

Aug. 8d. Readings at 0h. (La Paz), 1h. (Helwan), 3h. (near Tokyo), 5h. (Uccle), 10h. (Manila and Batavia), 12h. (La Paz), 13h. (Manila), 16h. (Taihoku), 21h. (San Fernando), 23h. (Calcutta).

Aug. 9d. Readings at 1h. (Batavia), 4h. (near Tacubaya), 5h. (near Manila), 10h. (Cape Town), 12h. (Helwan), 17h. (Manila), 21h. (San Fernando), 22h. (Apia).

Aug. 10d. 20h. 48m. 30s. Epicentre $40^{\circ}9'S$, $177^{\circ}1'E$. (as on 1917 Aug. 8d.).

$$A = -.755, B = +.038, C = -.655; \quad D = +.051, E = +.999; \\ G = +.654, H = -.033, K = -.756.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	21.7	281	e 5 0	-1	i 9 1	+ 2	e 12.1	14.4
Vienna	164.5	305	i 19 58	[-13]	—	—	—	21.0
Hamburg	164.7	330	e 19 50	[-22]	—	—	—	—
De Bilt	167.6	337	—	—	—	—	e 82.5	89.1
Strasbourg	169.3	319	e 20 4	[-10]	—	—	—	—
Moncalieri	171.2	301	—	—	e 60 30	?	74.7	—

Additional readings: Riverview gives $S = +8m.56s.$, $MN = +16.2m.$ De Bilt $MN = +85.9m.$

Aug. 10d. 21h. 53m. 49s. Epicentre $36^{\circ}3'N$, $26^{\circ}3'E$. (as on 1918 July 16d.).

$$A = +.722, B = +.357, C = +.592; \quad D = +.443, E = -.897; \\ G = +.531, H = +.262, K = -.806.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	2.6	311	0 41	0	—	—	1.2	1.6
Pompeii	10.2	299	4 17	?S	(4 17)	-18	—	—
Vienna	14.0	332	e 3 29	+ 3	—	—	—	11.7
Strasbourg	18.3	318	—	—	—	—	e 9.0	—
Hamburg	20.7	332	e 4 47	-2	—	—	—	—
Uccle	21.4	320	—	—	e 8 52	-1	—	—
De Bilt	21.7	323	—	—	e 8 57	-2	—	15.2

Additional readings: Athens gives $m = +54s.$ De Bilt $MN = +14.6m.$

Aug. 10d. Readings also at 2h. (La Paz), 5h. (near Mizusawa), 6h. (Port au Prince), 7h. (La Paz), 9h. (La Paz and Melbourne), 19h. (La Paz), 20h. (Manila), 22h. (De Bilt and Tacubaya), 23h. (near Tacubaya).

Aug. 11d. Readings at 5h. (near Athens), 8h. (Apia), 13h. (Batavia and Manila), 20h. (Victoria, Toronto, Rio Tinto, La Paz, Tacubaya, De Bilt, and near Manila), 21h. (San Fernando, Uccle, Helwan, and Paris).

Aug. 12d. 6h. 20m. 55s. Epicentre $25^{\circ}0'N$, $46^{\circ}0'W$. (as on 1919 Jan. 8d.).

$$A = +.630, B = -.652, C = +.423; \quad D = -.719, E = -.695; \\ G = -.294, H = -.304, K = -.906.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Washington	29.6	305	6 17	-7	11 35	+ 8	15.2	—
Toronto	33.0	316	—	—	—	—	e 18.6	21.2
Coimbra	34.8	54	e 2 54	?	8 4	?PR ₁	16.6	—
San Fernando	35.8	61	15 5	?L	—	—	(15.1)	23.1
Chicago	38.1	309	7 0	-39	13 5	-34	18.3	—
Eskdalemuir	43.4	35	—	—	—	—	19.1	—
Edinburgh	43.7	35	8 5	-19	—	—	—	—
Paris	44.5	45	e 8 26	-4	e 15 9	0	22.1	24.1
Uccle	46.1	42	e 8 35	-6	e 15 31	+ 2	e 20.1	—
De Bilt	46.9	42	e 8 59	+13	e 15 48	+ 8	e 21.6	24.4
Moncalieri	47.3	51	—	—	e 15 48	+ 3	23.2	—
Strasbourg	47.8	47	e 8 5	-48	—	—	—	—
Hamburg	50.1	40	e 9 5	-3	—	—	e 25.5	27.1
Vienna	53.5	47	—	—	e 19 5	?	—	—
Victoria	63.6	315	30 40	?L	—	—	(30.7)	37.6

Additional readings: Coimbra gives $ePE = +4m.14s.$ San Fernando $MN = +24.1m.$ De Bilt $MN = +23.9m.$, $T_0 = 6h.21m.18s.$

Aug. 12d. Readings also at 5h. (De Bilt), 6h. (Helwan and near La Paz), 9h. (near Mizusawa), 20h. (Pompeii), 21h. (Chicago), 22h. (near Taihoku).

Aug. 13d. 2h. 2m. 45s. Epicentre $18^{\circ}5S$. $63^{\circ}5W$. (as on 1918 Aug. 17d.).

A = +.423, B = -.849, C = -.317; D = -.895, E = -.446;
G = -.142, H = +.284, K = -.948.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	4.8	294	i 1 16	+ 2	2 3	- 8	2.1	2.2
Rio de Janeiro	E. 19.5	107	4 51	+16	10 57	?L	13.0	14.0
Washington	58.8	348	10 1	- 3	18 1	- 8	e 30.8	—
Harvard	N. 61.3	354	e 10 19	- 2	e 18 39	- 1	—	—
Ithaca	62.0	349	e 10 15	-10	—	—	—	—
Toronto	63.8	347	i 9 33	-64	(19 15)	+ 4	19.2	20.6
Chicago	64.2	340	9 56	-43	18 19	-56	e 32.2	—
Ottawa	64.8	351	i 10 45	+ 1	i 19 23	0	—	—
Cape Town	73.4	121	22 7	?S	(22 7)	+60	—	—
San Fernando	77.1	44	13 3	+61	—	—	—	23.2
Coimbra	E. 77.9	40	12 45	+39	22 31	+32	33.7	—
	N. 77.9	40	12 49	+43	e 22 35	+36	—	—
Granada	79.2	45	12 33	+19	17 43	?PR ₁	—	—
Algiers	83.6	48	e 12 57	+17	23 15	+10	42.8	45.2
Tortosa	83.9	43	12 45	+ 4	23 16	+ 8	37.4	60.0
Oxford	88.6	33	e 11 33	-95	i 23 35	-24	—	—
Stonyhurst	89.1	31	23 51	?S	(23 51)	-13	—	54.2
Paris	89.2	37	—	—	i 23 15	-50	37.2	54.2
Eskdalemuir	89.6	30	15 29	?	23 43	-27	—	—
Edinburgh	90.0	29	—	—	23 15	-59	—	—
Moncalieri	90.5	42	e 17 24	?PR ₁	31 21	?SR ₁	47.9	—
Uccle	91.1	36	e 13 3	-19	i 23 54	-31	e 43.2	—
Strasbourg	92.1	40	e 13 39	+11	e 24 1	-35	—	—
De Bilt	92.2	35	13 36	+ 8	i 24 0	-37	e 44.2	49.5
Pompeii	E. 93.4	48	16 33	?	23 23	-86	—	—
Hamburg	95.5	35	e 17 15	?PR ₁	i 24 18	-53	e 43.2	—
Vienna	97.3	41	e 17 45	?PR ₁	e 24 25	-64	—	—
Helwan	103.2	63	24 15	?S	(24 15)	-131	—	—
Colombo	142.5	103	85 15	?L	—	—	(85.2)	95.2
Mizusawa	E. 150.3	319	(19 45)	[-11]	19 45	?[P]	—	—
Batavia	153.6	158	20 2	[+ 1]	—	—	—	—
Manila	174.2	228	e 20 33	[+17]	—	—	—	—

Additional readings and notes: Rio de Janeiro gives its readings at 0h. Ottawa iN = +11m.21s., e = +13m.42s., i = +20m.5s. and +21m.15s. San Fernando MN = +24.2m. Oxford PR₁ = +17m.21s. Paris MN = +47.2m. Uccle PR₁ = +16m.51s. De Bilt ePR₁ = +17m.24s., MN = +59.2m., T₀ = 2h.3m.54s. Pompeii gives its readings at 1h. Mizusawa PN = +(19m.51s.), O-C = [-5]. Helwan PN = +30m.15s.

Aug. 13d. Readings also at 1h. (Taihoku), 8h. (Georgetown), 12h. (near Tacubaya), 14h. (Calcutta), 16h. (La Paz and near Tokyo), 21h. (La Paz and San Fernando).

Aug. 14d. Readings at 0h. (La Paz), 4h. (San Fernando), 8h. (Moncalieri), 9h. (La Paz, Colombo, and Helwan), 21h. (Stonyhurst (2)).

Aug. 15d. 6h. 59m. 8s. Epicentre $22^{\circ}2N$. $93^{\circ}2E$.

A = -.052, B = -.924, C = +.378; D = +.998, E = +.056;
G = -.021, H = +.377, K = -.926.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta	4.5	275	1 10	0	2 10	+ 6	3.6	—
Simla	16.8	306	5 16	+74	—	—	—	8.9
Kodaikanal	19.3	234	13 28	?	—	—	—	—
Bombay	19.4	264	8 21	?S	(8 21)	+11	—	—
Colombo	20.0	222	8 52	?S	(8 52)	+29	—	—
Taihoku	26.1	78	—	—	e 11 13	+49	—	—
Zi-ka-wei	26.6	64	e 5 52	- 2	e 10 24	- 9	—	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Batavia	31.4	155	c 7 6	+24	—	—	—	14.1
Hamburg	68.3	323	—	—	26 52	?SR ₁	—	—
Strasbourg	70.6	316	e 11 24	— 3	—	—	e 37.9	—
Moncalieri	71.4	313	—	—	e 21 49	+66	40.6	—
De Bilt	71.5	320	—	—	e 20 53	+ 9	—	46.3
Uccle	72.2	320	—	—	e 20 47	- 5	e 36.9	39.9
Paris	73.9	318	—	—	—	—	39.9	40.9
Edinburgh	75.2	325	—	—	28 52	?SR ₁	—	—
Stonyhurst	75.4	321	44 34	?L	—	—	(44.6)	—
La Paz	161.5	285	20 14	[+ 5]	—	—	—	—

Additional readings: Moncalieri gives S? - -32m.19s. De Bilt MN = +40.4m.

1920. Aug. 15d. 8h. 16m. 33s. Epicentre 13°0S. 166°8E.

(as on 1919 Nov. 20d.).

A = -0.949, B = +.222, C = -0.225; D = +.228, E = +.974;

G = +.219, H = -0.051, K = -0.974.

A depth of focus 0.030 has been assumed for this shock, as was done in the case of a former shock from the same origin (1918 Dec. 14d.).

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia	E.	-1.2	20.8	95	4 40	+ 4	i 9 2	+47	10.6
Riverview		-1.6	25.2	213	i 5 31	- 7	e 9 44	- 8	e 10.2
Sydney		-1.6	25.2	213	5 15	- 9	9 39	+ 3	12.8
Christchurch		-2.1	31.0	170	8 39	?PR ₁	13 33	?PR ₁	17.3
Melbourne		-2.1	31.5	214	6 45	- 23	12 3	+39	18.4
Honolulu		-3.0	48.6	46	i 8 45	+ 8	i 15 33	+11	e 22.4
Manila		-3.3	53.2	300	e 9 7	+ 1	(16 1)	-17	16.0
Tokyo		-3.4	55.0	334	9 22	+ 5	12 52	?PR ₁	14.9
Osaka		-3.4	56.2	329	9 17	- 8	16 55	+ 1	23.9
Mizusawa	E.	-3.5	57.4	339	9 32	0	17 8	0	—
	N.	-3.5	57.4	339	9 31	- 1	17 6	- 2	—
Nagasaki		-3.5	57.8	325	e 9 10	-25	—	—	9.6
Taihoku		-3.5	58.3	311	e 9 39	+ 1	(17 18)	- 1	17.3
Batavia		-3.6	59.4	270	i 9 26	-19	—	—	e 26.7
Zi-ka-wei		-3.6	62.1	316	10 9	- 7	e 19 17	-72	—
Ootomari		-3.7	63.4	343	9 54	-16	—	—	—
Berkeley	N.	-4.1	83.5	49	e 12 14	- 1	—	—	—
Calcutta		-4.1	84.6	295	12 39	-17	—	—	—
Victoria		-4.1	86.9	36	11 32	-63	22 21	-34	22.4
Colombo		-4.2	88.7	277	(12 27)	-18	12 27	?P	24.4
Tucson	E.	-4.2	90.5	57	e 12 54	- 1	23 40	+ 7	41.8
Kodaikanal		-4.2	91.6	280	17 33	?PR ₁	(23 9)	-36	23.2
Simla		-4.3	96.5	300	—	—	e 22 33	-124	—
Bombay		-4.4	97.9	286	13 41	+ 6	—	—	45.6
Mauritius		-4.5	102.7	246	23 39	?S	23 39	-119	—
Chicago		—	110.2	49	17 25	?PR ₁	27 27	- 3	53.4
Ann Arbor	E.	—	113.1	49	17 51	[-40]	28 9	+14	50.7
	N.	—	113.1	49	—	—	28 3	- 8	50.6
Toronto		—	116.1	47	—	—	30 21	+122	e 64.6
La Paz		—	118.1	117	i 18 50	[3]	29 49	+74	56.4
Ithaca		—	118.3	48	—	—	—	—	e 52.4
Washington		—	118.4	51	19 27	[+39]	29 27	+50	e 53.4
Ottawa		—	118.4	45	e 18 37	[-11]	29 35	+58	e 50.4
Cape Town		—	124.2	212	23 9	?PR ₁	—	—	73.6
Lemberg		—	132.2	328	—	—	e 28 33	?	87.6
Dyce		—	135.0	352	i 19 11	[-19]	—	—	22.7
Hamburg		—	135.5	340	i 19 9	[-22]	e 22 21	?PR ₁	e 63.4
Edinburgh		—	136.4	352	18 27	-66	—	—	63.4
Eskdalemuir		—	137.0	352	e 19 58	-36	—	—	22.4
Vienna		—	137.1	331	19 2	[-32]	—	—	39.4
De Bilt		—	138.2	343	19 11	[-25]	—	—	e 60.4
Stonyhurst		—	138.3	351	22 27	?PR ₁	—	—	23.4
Athens		—	138.8	314	e 19 18	[-20]	22 47	?PR ₁	—

Continued on next page.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Uccle	—	139.6	343	19 13	[-26]	—	—	45.4	68.6
Oxford	—	140.0	349	19 17	[-22]	22 42	? PR ₁	—	77.2
Strasbourg	—	140.4	338	19 8	[-32]	—	—	e 66.4	81.4
Zurich	—	141.1	336	e 19 10	[-31]	—	—	—	—
Padova	—	141.2	332	18 46	[-55]	24 1	? PR ₁	—	—
Paris	—	141.9	345	e 19 19	[-24]	i 22 54	? PR ₁	51.4	79.4
Besançon	—	142.2	339	19 19	[-24]	22 28	? PR ₁	53.4	—
Pompeii	E.	143.2	324	18 26	[-79]	25 36	?	31.4	—
Moncalieri	—	143.4	335	19 19	[-27]	37 14	?	60.4	88.2
Barcelona	—	144.4	337	i 19 34	[-19]	—	—	20.1	—
Tortosa	—	149.7	339	19 35	[-20]	—	—	53.8	82.0
Algiers	—	152.1	332	19 35	[-24]	—	—	41.4	79.0
Coimbra	E.	152.5	352	20 17	[+17]	29 17	?	43.4	84.8
	N.	152.5	352	20 14	[+14]	—	—	—	86.6
Granada	—	154.3	342	20 44	[+43]	32 1	?	—	—
San Fernando	—	155.7	346	19 47	[-16]	—	—	—	116.4

Additional readings : Apia gives PR₁ = +5m.36s., i = +6m.47s. Riverview
 iP = +5m.2s., PR₁ = +6m.6s. and +6m.23s., PS = +10m.6s., T₂ =
 8h.14m.17s. Epicentre 1° 0S. 163° 5E. Manila S = +13m.37s., MN =
 +17.0m. Osaka MN = +25.1m., T₂ = 8h.16m.18s. Taihoku e =
 +10m.33s. Berkeley ePE = +12m.26s. Colombo P = +6m.27s.
 Toronto L = +46.2m., eL = +72.2m. La Paz i = +29m.16s., T₂ =
 8h.22m.17s. Ottawa SR₁E = +36m.9s., L = +69.4m., and +72.4m.,
 +82.4m., and +103.4m., T₂ = 8h.22m.8s. Lemberg e = +38m.45s.
 Dyce i = +11m.7s. Vienna iP = +19m.11s., PR₁ = +21m.55s., PR₂ =
 +22m.45s. De Bilt PR₁ = +22m.3s., MN = +70.8m. Uccle PR₁ =
 +22m.9s. Strasbourg PR₁ZN = +22m.12s. Barcelona i = +20m.16s.
 Coimbra PR₁N? = +22m.49s., PR₁E? = +22m.41s., PR₂N = +24m.49s.,
 PR₂E = +24m.41s. San Fernando MN = +95.0m.

Aug. 15d. Readings also at 0h. (Chicago), 1h. (Eskdalemuir, Uccle, De Bilt, and near Mizusawa and Tokyo), 2h. (Mizusawa and Florence), 6h. (Helwan, La Paz, and Stonyhurst), 8h. (Moncalieri and Batavia), 11h. (near Osaka, Kobe, and Tokyo), 12h. (Moncalieri), 13h. (Melbourne, Sydney, Riverview, and near Tacubaya), 14h. (Helwan, Uccle, and De Bilt), 21h. (La Paz and Taihoku), 22h. (De Bilt, Taihoku (2), Zi-ka-wei (2), and Manila).

Aug. 16d. 14h. 41m. 38s. Epicentre 34° 0N. 14° 0E. (as on 1920 July 20d.).

$$A = +.804, B = +.201, C = +.559; \quad D = +.242, E = -.970; \\ G = +.543, H = +.135, K = -.829.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Pompeii	6.8	3	1 44	0	2 57	- 8	—	3.2
Athens	8.8	62	2 15	- 2	e 2 22	?	i 3.0	3.2
Florence	10.0	348	5 22	? L	—	—	(5.4)	8.4
Padova	11.5	353	3 37	+45	—	—	5.9	—
Moncalieri	12.0	338	e 5 10	? S	(5 10)	- 9	9.2	11.0
Zurich	14.0	345	e 4 19	+53	—	—	—	—
Vienna	14.3	6	3 30	0	6 1	-14	e 6.4	6.9
Helwan	15.2	101	13 22	?	—	—	—	—
Strasbourg	15.3	344	e 4 22	+39	—	—	8.4	—
Paris	17.1	334	—	—	7 22	+ 2	—	—
Lemberg	17.4	22	c 5 46	+96	—	—	—	7.5
Uccle	18.2	340	—	—	—	—	e 10.1	—
De Bilt	19.2	343	—	—	8 22	+14	e 10.0	10.7
Hamburg	19.8	353	—	—	e 8 22	+ 3	—	12.1
Eskdalemuir	24.4	336	—	—	—	—	12.4	—

Additional readings : Padova gives +5m.52s. +10m.30s. and +18m.22s.
 Moncalieri S = +7m.42s. (iSR₁).

Aug. 16d. Readings also at 2h. (Manila and San Fernando), 6h. (Helwan), 17h. (near Tokyo), 21h. (San Fernando), 22h. (Batavia and La Paz).

Aug. 17d. 7h. 42m. 50s. Epicentre $44^{\circ}5'N$. $140^{\circ}0'E$. (as on 1919 Mar. 12d.).

A = -546, B = +458, C = +701; D = +643, E = +766;

G = -537, H = +451, K = -713.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Ootomari		2.9	42	0 55	+10	—	—	1.4	2.1
Mizusawa	E.	5.5	170	1 18	-7	2 11	-20	—	—
	N.	5.5	170	1 23	-2	2 16	-15	—	—
Tokyo		8.9	181	2 24	+9	—	—	3.6	3.6
Kobe		10.5	202	—	—	4 59	+16	5.0	5.0
Zi-ka-wei		19.7	233	c 4 31	-6	—	—	—	—
De Bilt		75.8	333	—	—	—	—	c 37.2	42.2
Ucele		77.2	333	—	—	—	—	c 38.2	—
La Paz		143.3	49	21 30	?PR ₁	—	—	—	—

Kobe gives its reading at 6h. De Bilt MN = +47.6m.

Aug. 17d. Readings also at 0h. and 1h. (Lick), 2h. (Strasbourg, Honolulu, and near Tokyo and Apia), 3h. (Victoria, Ucele, San Fernando, and De Bilt), 4h. (Helwan), 7h. (Lick), 8h. (near Port au Prince), 16h. (near Mizusawa), 20h. (De Bilt), 21h. (San Fernando and Manila).

Aug. 18d. Readings at 1h. (near Kobe), 5h. (Helwan and Colombo), 7h. (Zi-ka-wei and Taihoku (2)), 9h. (Helwan), 10h. (Taihoku), 11h. (Rio Tinto), 19h. (Taihoku), 20h. (San Fernando), 21h. (Helwan, Paris, De Bilt, Hamburg, and near Calcutta).

Aug. 19d. Readings at 1h. (Taihoku, Simla, Zi-ka-wei, and Manila), 2h. (Taihoku, Moncalieri, Ucele, De Bilt, and Eskdalemuir), 3h. and 4h. (La Paz), 7h. (near Rocca di Papa), 8h. (La Paz), 10h. (Moncalieri), 11h. (near Tacubaya), 19h. (Taihoku), 21h. (Tortosa and near La Paz), 23h. (San Fernando and Mizusawa).

1920. Aug. 20d. 16h. 15m. 28s. Epicentre $38^{\circ}0'S$. $73^{\circ}5'W$.

(Suggested by La Paz).

A = +224, B = -755, C = -616; D = -959, E = -284;

G = -175, H = +590, K = -788.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz		22.0	14	i 5 8	+3	i 9 15	+10	11.5	15.7
Vieques	E.	56.7	9	—	—	17 41	-1	e 26.5	31.4
Oaxaca		59.3	333	20 17	?	27 34	?	31.3	34.1
Tacubaya		62.3	331	10 45	-18	19 5	+13	28.2	36.8
Cape Town		71.2	119	12 4	+40	21 14	+34	—	53.7
Cheltenham	N.	76.8	358	e 12 1	+1	21 48	+1	48.5	—
Georgetown		77.0	357	—	—	—	—	e 40.7	—
Washington		77.0	357	11 57	-4	21 40	-9	37.0	—
Tucson	E.	78.5	329	—	—	—	—	38.6	45.4
Harvard	E.	80.4	1	e 11 39	-42	22 25	-3	40.4	—
Ithaca		80.5	358	e 11 42	-40	21 44	-45	36.2	—
Chicago		80.6	350	11 22	-61	21 28	-62	38.8	—
Toronto		81.8	356	—	—	—	—	46.9	54.8
Ottawa		83.4	359	i 12 35	-3	i 22 53	-8	e 37.0	—
Lick		87.5	323	—	—	—	—	e 42.3	—
Apia		87.9	256	—	—	23 50	-1	40.9	—
Berkeley	Z.	88.2	323	e 13 2	-4	—	—	e 42.2	—
Melbourne		96.3	210	24 2	?S	(24 2)	-77	47.2	52.3
San Fernando		97.0	49	17 50	?PR ₁	24 38	-48	46.8	63.5
Victoria		97.1	329	23 40	?S	(23 40)	-107	42.8	51.2
Riverview		97.1	217	e 24 10	?S	(e 24 10)	-77	c 43.8	49.1
Rio Tinto		97.6	47	25 32	?S	(25 32)	0	—	67.5
Coimbra	E.	98.2	43	e 11 32	-149	24 27	-71	43.5	57.2
	N.	98.2	43	c 17 5	?PR ₁	—	—	—	57.5
Honolulu		98.9	290	—	—	—	—	e 92.5	—
Granada		99.0	50	i 17 52	?PR ₁	—	—	—	—
Adelaide		101.2	206	—	—	—	—	e 49.8	60.5
Algiers		102.6	52	e 18 16	?PR ₁	27 37	.77	48.5	57.5
Tortosa		103.8	49	18 26	?PR ₁	27 31	+60	40.6	63.8

Continued on next page.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Barcelona		105.2	50	e 18 35	?PR ₁	—	—	e 45.0	58.5
Maruitius	E.	106.1	133	23 32	?	—	—	—	34.2
	N.	106.1	133	27 2	?S	(27 2)	+ 9	—	54.5
Oxford		109.5	38	18 56	?PR ₁	28 42	+78	—	63.0
Paris		109.8	41	e 18 58	?PR ₁	i 28 39	+73	51.5	60.5
Kew		109.9	38	28 32	?S	(28 32)	+65	—	71.5
Stonyhurst		110.2	37	19 14	?PR ₁	28 32	+62	63.2	66.1
Moncalieri		110.5	47	e 16 19	+79	28 46	+73	45.8	71.5
Besançon		110.7	45	19 0	?PR ₁	—	—	54.5	—
Eskdalemuir		110.8	35	19 21	?PR ₁	28 49	+74	46.5	64.2
Edinburgh		111.2	34	19 17	?PR ₁	28 56	+77	45.5	64.8
Rocca di Papa		111.8	51	e 19 18	?PR ₁	e 28 56	+72	e 56.0	60.6
	N.	111.8	51	e 19 18	?PR ₁	e 27 12	-32	e 51.8	75.0
Uccle		111.9	40	e 18 32	[+ 3]	29 1	+76	e 51.5	62.0
Florence		112.0	50	25 32	?S	35 32	?	54.5	62.5
Zurich		112.3	46	—	—	—	—	e 55.5	—
Strasbourg		112.5	45	e 18 32	[+ 2]	e 29 9	+79	52.0	66.8
Pompeii	E.	112.5	53	17 40	[-50]	27 40	-10	55.5	66.5
Dyce	N.	112.5	32	—	—	(29 10)	+80	29.2	62.5
De Bilt	E.	113.0	40	—	—	27 32	-22	e 50.5	62.6
	N.	113.0	40	—	—	e 27 20	-34	e 52.5	70.2
Padova		113.2	49	18 4	[-28]	27 59	+ 3	47.9	67.3
Hamburg		116.3	40	e 19 38	?PR ₁	e 29 39	+79	e 53.5	64.3
Vienna		117.3	46	—	—	—	—	e 53.5	69.9
Helwan	E.	118.8	73	55 14	?L	—	—	(55.2)	78.8
	N.	118.8	73	54 2	?L	—	—	(54.0)	79.9
Lemberg		122.5	49	—	—	—	—	e 63.6	74.0
Batavia		135.8	180	e 20 53	?PR ₁	—	—	e 71.4	—
Colombo		140.6	138	25 32	?	—	—	81.5	83.5?
Kodaikanal		141.9	129	68 56	?L	—	—	80.1	83.4
Manila		153.3	213	e 19 32	[-28]	—	—	—	121.3
Simla		155.0	97	—	—	—	—	e 77.8	81.0
Zi-ka-wei		166.0	245	e 24 53	?PR ₁	e 35 39	?	—	—

Additional readings : La Paz gives $i = +9m.43s.$, $T_0 = 16h.15m.29s.$ Epicentre $38^{\circ}08'.73''W.$, as adopted. Vieques $eLN = +26.6m.$, assuming 52 is a misprint for 42 in the reading. Tacubaya $LN = +29.9m.$ Georgetown $eLN = +40.5m.$, $LE = +47.5m.$, $LN = +45.8m.$ Tucson $LN = +39.6m.$ Harvard $L?? = +36.3m.$, $L = +49.9m.$ and $+61.5m.$ and $+109.0m.$, $T_0? = 16h.14m.59s.$ Toronto $eL = +53.1m.$ and $+65.9m.$ Ottawa $e?N = +7m.2s.$, $eE = +27m.52s.$, $T_0? = 16h.15m.43s.$ Berkeley $eLE = +42.4m.$, $eLN = +42.5m.$ Melbourne $S = +32m.2s.$ (??SR₁). San Fernando $MN = +60.5m.$ Victoria $S = +32m.2s.$ Riverview $eS = +31m.40s.$, $e = +41m.19s.$ and $41m.53s.$, $MN = +49.3m.$ Adelaide $e = +51m.50s.$, $+53m.8s.$, and $55m.32s.$ Barcelona $eL_1 = +27m.46s.$ (??S). Rocca di Papa $LN = +59.0m.$ Uccle $e = +25m.32s.$, $MN = +61.6m.$ Strasbourg $MN = +64.7m.$ De Bilt $eS = +29m.18s.$ (O-C = -36s.). Hamburg $e = +30m.2s.$, $MN = +65.6m.$, $MZ = +65.4m.$ Helwan PEN increased by 2hrs. Moncalieri $MN = +66.4m.$ Lemberg $e = +73m.8s.$ Batavia $eL = +78.4m.$ and $85.4m.$

Aug. 20d. Readings also at 0h. (La Paz), 2h. (Riverview, La Paz, and Manila), 3h. (Apia), 13h. (Apia, Riverview, and Moncalieri), 14h. (Apia, Strasbourg, Uccle, Manila, Pompeii, Melbourne, Adelaide, and Padova), 18h. (La Paz), 19h. (La Paz (3)), 22h. (near La Paz), 23h. (near Tokyo and near Rocca di Papa).

Aug. 21d. 21h. 19m. 18s. Epicentre $53^{\circ}0'.N. 23^{\circ}0'.W.$ (very doubtful).

A = +.554, B = -.235, C = +.799; D = -.391, E = -.920;
G = +.735, H = -.312, K = -.602.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Eskdalemuir		11.8	71	—	—	—	—	5.7	—
Edinburgh		11.8	68	3 12	+16	—	—	—	11.2
Oxford		13.2	86	—	—	—	—	—	10.8
Kew		13.9	87	—	—	—	—	—	10.7
Coimbra		16.2	136	e 3 13	-42	—	—	7.9	10.5
Paris		16.5	94	—	—	—	—	e 7.7	12.7
Uccle		16.9	86	e 4 10	+ 6	—	—	8.3	11.7
De Bilt	E.	17.0	82	—	—	—	—	e 7.4	14.3
	N.	17.0	82	—	—	—	—	e 8.5	12.1

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Besançon	19.3	96	10 42	?L	—	—	(10.7)	11.7
Hamburg	19.5	75	e 4 36	+ 1	—	—	e 11.7	15.7
Strasbourg	19.8	90	4 30	- 9	—	—	e 9.4	13.7
Tortosa	20.0	118	4 42	+ 1	—	—	9.1	14.8
San Fernando	20.3	138	1 42	?	—	—	—	—
Granada	20.8	132	—	—	e 10 2	?L	(e 10.0)	—
Moncalieri	21.5	99	—	—	e 9 26	+31	12.1	—
Vienna	25.1	85	—	—	—	—	e 15.3	16.2
Rocca di Papa	26.3	101	—	—	—	—	e 16.3	19.9
Harvard	33.4	271	—	—	(13 2)	-32	15.3	—
Ottawa	34.5	279	e 7 8	- 1	—	—	17.7	—
Helwan	45.4	98	33 42	?	—	—	—	—

Additional readings: Coimbra gives eE - 5m.27s., MN = +10.4m. Paris
 MN - +10.7m. Hamburg MN - +15.1m. Harvard gives a possible
 S as LE?. Helwan PE = +32m.42s.

Aug. 21d. Readings also at 0h. (San Fernando), 2h. (Helwan and Moncalieri),
 6h. (Lick), 8h. (near Tokyo), 9h. (La Paz), 16h. (Apia and La Paz).

Aug. 22d. Readings at 0h. (Riverview), 1h. (near Tokyo), 4h. (Helwan), 5h. and
 11h. (La Paz), 21h. (San Fernando), 23h. (Kew).

Aug. 23d. Readings at 2h. (near Batavia), 5h. (La Paz), 6h. (near Batavia), 7h.
 (La Paz and Taihoku (2)), 10h. (near Mizusawa), 11h. (La Paz), 16h.
 (near Mizusawa), 23h. (Apia, Taihoku, and San Fernando).

Aug. 24d. Readings at 2h. (La Paz), 17h. (La Paz, Helwan, and Moncalieri),
 18h. (Rio Tinto and De Bilt).

Aug. 25d. 21h. 53m. 25s. Epicentre $7^{\circ}0'S$, $148^{\circ}0'E$. (as on 1919 Oct. 21d.).

A = -842, B = +526, C = -122; D = +530, E = +848;
 G = +103, H = -065, K = -992.

Very doubtful. The determinations of T_0 from S-P are quite discordant.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	27.0	174	e 5 23	-35	e 10 30	-11	e 13.0	16.2
Sydney	27.0	174	5 17	-41	10 35	- 6	14.6	16.1
Adelaide	29.3	196	e 6 59	+38	i 11 29	+ 7	13.1	18.6
Melbourne	30.9	185	—	—	11 53	+ 3	18.1	20.3
Manila	34.4	309	e 7 25	+17	—	—	15.6	—
Perth	39.0	226	9 10	?PR ₁	13 45	- 7	22.6	—
Batavia	40.9	269	e 8 23	+21	i 13 59	-21	e 24.2	—
Taihoku	41.1	322	—	—	e 14 7	-15	17.5	—
Osaka	43.4	345	7 58	-23	—	—	—	15.2
Nagoya	43.5	348	8 5	-17	—	—	—	—
Honolulu	60.1	60	11 5	+52	19 29	+65	28.6	38.3
Mauritius	87.7	250	37 59	?L	—	—	(38.0)	47.2
Victoria	94.4	42	—	—	—	—	—	51.2
Helwan	116.5	299	21 35	?PR ₁	(29 35)	+73	—	—
Cape Town	117.1	226	64 50	?L	—	—	(64.8)	69.3
Vienna	122.0	324	e 18 35	[-23]	—	—	e 47.6	71.1
Hamburg	122.5	332	—	—	e 20 35	?PR ₁	e 59.6	62.6
De Bilt	125.6	331	—	—	—	—	e 59.6	64.5
Edinburgh	126.1	340	29 35	?S	(29 35)	+ 1	63.6	—
Eskdalemuir	126.5	340	e 21 5	?PR ₁	e 31 7	+90	52.6	—
Strasbourg	126.6	326	—	—	—	—	e 61.6	63.6
Uccle	126.8	330	e 21 8	?PR ₁	e 38 5	?SR ₁	e 58.6	—
Rocca di Papa	127.4	319	e 20 5	[+53]	—	—	—	77.7
Stonyhurst	127.5	340	59 35	?L	68 35	?	(59.6)	—
Moncalieri	128.8	325	e 21 21	?PR ₁	39 4	?SR ₁	62.1	—
Paris	129.0	330	e 20 35	[+79]	—	—	63.6	64.6
La Paz	137.2	124	i 19 38	[+ 4]	i 23 12	?PR ₁	—	—
Coimbra	140.6	330	21 35	?PR ₁	34 14	?	e 64.2	—
San Fernando	142.3	325	26 35	?	—	—	—	—

Additional readings: Riverview gives MN = +19.2m., MZ = +18.4m., T_0 =
 21h.52m.21s. Perth SR₁ = +17m.38s. Batavia i = +9m.30s. De
 Bilt ePR₁ = +20m.58s., MN = +64.8m. Stonyhurst P = +31m.11s.,
 ?S of the present shock.

Aug. 25d. Readings also at 0h. (San Fernando), 3h. (Batavia), 5h. (Manila), 9h. (La Paz), 17h. (La Paz and Batavia).

Aug. 26d. 22h. 59m. 54s. Epicentre 52° - 5 N. 170° - 0 W.

A = -600, B = -106, C = +793; D = -174, E = +985;
G = -781, H = -138, K = -609.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		m.	s.	m.	s.	m.	s.	m.	m.
Sitka	V.	20.3	63	—	—	e 8	22	-7	—
Victoria		29.5	79	(6 10)	-13	6	10	?P	10.6
Honolulu		32.4	158	e 7 54	+62	12	6	-8	16.1
Berkeley	E.V.	35.8	95	e 6 58	-22	—	—	e 16.2	—
Mizusawa	N.	35.8	269	7 11	-9	12	53	-14	—
	E.	35.8	269	7 10	-10	12	50	-17	—
Tokyo		38.9	268	7 29	-16	e 8 58	?PR ₁	15.2	—
Osaka		42.1	269	8 5	-7	—	—	—	18.4
Kobe	E.N.	42.3	269	6 53	-80	e 14 28	-11	e 20.0	21.4
Tucson	E.	46.5	91	e 8 31	-13	—	—	23.9	27.5
Zi-ka-wei		53.1	276	e 9 24	-3	e 16 58	+1	—	—
Chicago		53.9	68	8 16	-76	15 39	-89	24.4	—
Ann Arbor	E.	55.7	65	8 36	-68	17 6	-24	28.9	—
Toronto		57.1	61	9 12	-41	17 30	-17	e 32.9	39.9
Taihoku		57.4	271	—	—	e 18 33	+42	—	—
Ottawa		58.7	57	i 9 52	-11	e 17 39	-28	e 27.6	—
Washington		61.7	62	10 20	-3	18 36	-8	e 30.0	—
Georgetown	E.	61.7	62	i 10 19	-4	18 37	-7	33.1	—
Cheltenham	N.	61.9	62	10 23	-1	18 44	-3	31.1	31.8
Harvard	E.	62.3	56	10 25	-2	19 47	+55	e 33.4	—
	N.	62.3	56	—	—	19 5	+13	e 33.3	—
Manila		65.8	265	e 11 6	+16	20 24	+49	37.2	37.2
Edinburgh		71.1	10	—	—	i 20 36	-3	—	51.1
Eskdalemuir		71.6	10	11 28	+1	20 51	+6	33.1	(43.1)
Stonyhurst		73.2	10	21 24	?S	(21 24)	+20	—	53.1
Hamburg		74.0	0	i 11 44	+2	e 21 16	+2	e 35.1	44.8
De Bilt		75.4	4	11 52	+1	21 32	+2	e 32.1	52.1
Kew		75.7	9	—	—	—	—	—	48.1
Uccle		76.6	5	11 57	-2	21 44	0	e 32.1	38.1
Lemberg		77.0	351	—	—	—	—	e 41.0	52.1
Oxford		77.6	9	—	—	i 21 29	-27	—	53.7
Simla		78.0	309	—	—	e 20 42	-78	e 42.2	51.0
Paris		78.6	7	i 12 8	-3	e 22 5	-2	37.1	53.1
Strasbourg		79.0	2	i 12 11	-2	i 22 13	+1	e 38.1	—
Vienna		79.1	357	i 12 12	-2	22 14	+1	i 38.7	53.8
Zurich		80.2	1	e 12 18	-2	—	—	—	—
Padova		82.0	359	10 52	-98	22 18	-28	—	—
Moncalieri		82.5	2	12 32	-1	22 42	-10	42.5	55.4
Florence		83.7	0	13 26	+46	—	—	—	22.8
Barcelona		85.8	7	e 12 53	+1	i 23 19	-9	e 41.8	—
Rocca di Papa		85.8	358	i 12 47	-5	23 11	-17	—	—
	N.	85.8	358	e 12 45	-7	23 14	-14	e 50.0	62.2
Coimbra	E.	86.0	13	e 12 44	-9	i 23 21	-9	e 37.6	54.9
	N.	86.0	13	—	—	—	—	e 39.7	55.0
Tortosa		86.4	8	12 44	-11	23 12	-22	e 41.1	59.2
Pompeii	E.	86.7	357	12 40	-17	23 10	-28	—	—
Rio Tinto		88.6	13	30 6	?SR ₁	—	—	—	63.6
Granada		89.6	11	13 8	-6	23 56	-14	—	—
San Fernando		90.0	12	39 42	?	50 6	?L	(50.1)	66.6
Algiers		90.6	5	e 12 2?	-77	24 3	-17	61.1	—
Batavia		90.8	263	e 16 39	?PR ₁	e 24 41	+19	—	—
Kodaikanal		95.2	296	54 54	?L	—	—	59.1	61.4
Helwan		95.6	341	19 6	?PR ₁	(25 6)	-6	—	—
Melbourne		98.4	215	—	—	—	—	—	49.6
La Paz		110.2	91	e 18 11	[-12]	—	—	69.1	75.7

Additional readings: Victoria gives P = +1m.15s. Berkeley e?N = +16m.52s. Osaka MN = +18.0m. Tucson ePN = +8m.30s.
Toronto i = +12m.48s. Ottawa PR₁E = +12m.19s., T₀ = 23h.0m.4s.
Georgetown iPN = +10m.20s., eL = +30.1m., LN = +34.3m., T₀ = 22h.59m.58s.
Cheltenham PE = +10m.21s., T₀ = 22h.59m.54s. Manila MN = +39.6m. Harvard eN = +31m.0s., LE = +36.6m., LN = +39.1m. and +43.1m., T₀ = 22h.58m.55s. Eskdalemuir LN = +13.1m., T₀ = 22h.59m.58s. Hamburg MN 50.1m., T₀ = 23h.0m.4s. De Bilt eLN = +41.1m., MN 53.2m. Uccle MN = 53.1m., T₀ = 23h.0m.4s. Paris iS = 22m.14s. Vienna SN = 22m.15s., T₀ = 23h.0m.3s. Padova gives +11m.57s. and +21m.6s. Moncalieri MN = +58.6m. Granada P8 = +24m.12s., T₀ = 23h.0m.11s. San Fernando MN = +60.1m. La Paz i = +19m.29s. (?PR₁).

Aug. 26d. Readings also at 18h. (near Tokyo), 22h. (Toronto).

Aug. 27d. 3h. 25m. 8s. Epicentre $2^{\circ}08'S$, $133^{\circ}00'E$. (as on 1918 Jan. 21d.).

A = -0.682 , B = $+0.731$, C = -0.035 ; D = $+0.731$, E = $+0.682$;
G = $+0.024$, H = -0.026 , K = $+0.999$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	20.5	325	e 4 43	- 4	—	—	—	—
Batavia	26.4	260	e 5 52	0	—	—	e 15.4	—
Riverview	36.1	154	c 18 54	?L	e 21 54	?	e 23.0	25.6
Melbourne	37.4	165	—	—	—	—	19.9	21.9
Honolulu	71.2	67	c 23 10	?S	(e 23 10)	?	e 39.9	44.7
La Paz	152.1	132	20 18	[-19]	—	—	—	—

Riverview gives MN = $+29.2m$.

Aug. 27d. Readings also at 0h. (Cape Town and near Apia), 1h. (Riverview), 4h. (Helwan), 7h. (Helwan, Simla, and Melbourne), 8h. (De Bilt), 11h. (Riverview (2) and Apia), 12h. (Apia, Helwan, and Riverview), 13h. (Chicago, Riverview, and Apia), 15h. (Rocca di Papa), 20h. (Taihoku).

Aug. 28d. Readings at 0h. and 4h. (Helwan), 7h. (La Paz, Oaxaca, and Tacubaya), 10h. (near Tacubaya), 12h. (near Tacubaya and Mazatlan), 13h. (Rocca di Papa), 14h. (Rocca di Papa and La Paz), 17h. (Taihoku), 20h. (La Paz and near Tacubaya), 22h. (San Fernando).

Aug. 29d. 10h. 49m. 8s. Epicentre $18^{\circ}08'S$, $170^{\circ}10'E$. (as on 1920 Jan. 29d.).

A = -0.937 , B = $+0.164$, C = -0.309 ; D = $+0.172$, E = $+0.985$;
G = $+0.304$, H = -0.053 , K = -0.951 .

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	23.2	223	e 5 25	+ 6	e 9 38	+ 9	e 11.3	12.4
Sydney	23.2	223	6 16	+57	—	—	12.4	13.5
Christchurch	25.6	176	—	—	10 4	-10	14.5	17.3
Melbourne	29.6	223	—	—	11 22	- 5	15.7	17.9
Adelaide	32.7	233	—	—	—	—	—	20.9
Honolulu	50.2	40	16 10	?S	(16 10)	-11	23.2	31.7
Chicago	110.9	51	—	—	—	—	e 53.4	—
Toronto	117.0	50	—	—	—	—	e 64.7	68.2
Ottawa	119.6	47	—	—	—	—	e 61.2	—
Helwan	140.7	295	77 52	?L	—	—	(77.9)	—
Uccle	145.3	344	—	—	—	—	e 79.9	—
Strasbourg	146.2	339	20 5	[+15]	—	—	—	—
Rocca di Papa	149.4	326	e 19 59	[+ 4]	29 54	? e	157.3	160.1

Additional readings: Riverview gives MN = $+13.6m$. Christchurch SR₁? = $+12m.32s$. Chicago LE = $+57.4m$. Helwan PE = $+86m.52s$. Rocca di Papa ePN = $+20m.19s$. The L and M for this station probably belong to a later shock; possibly that at 12h. relegated to the notes.

Aug. 29d. Readings also at 0h. (Cape Town), 1h. (Perth), 5h. (Manila), 7h. (La Paz), 8h. (Manila), 9h. (Zi-ka-wei and Taihoku), 12h. (Tucson), 13h. (Chicago), 22h. (San Fernando and Taihoku).

Aug. 30d. Readings at 3h. (near Tokyo), 5h. (Helwan), 6h. (La Paz), 14h. (Manila), 17h. (Taihoku), 18h. (Helwan), 19h. (near Athens), 22h. (San Fernando).

Aug. 31d. Readings at 4h. (Stonyhurst and La Paz), 7h. (near Osaka and near Kobe (2)), 8h. (near Kobe (2)), 11h. (Helwan), 14h. (Taihoku), 16h. (Lick), 17h. (La Paz), 21h. (near Rocca di Papa and Pompeii), 22h. (San Fernando), 23h. (Cape Town).

Sept. 1d. 2h. 45m. 50s. Epicentre $3^{\circ}08'$ S. $88^{\circ}00'$ W. (as on 1918 Feb. 3d.).

A = $-.035$, B = $-.998$, C = $-.052$; D = $-.999$, E = $-.035$;
G = $-.002$, H = $+.052$, K = $-.999$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz	23.8	126	5 10	-16	—	—	—	—
Tacubaya	25.0	334	—	—	9 53	-10	12.8	13.2
Chicago	44.8	1	8 28	-4	15 50	+38	—	—
Toronto	47.3	8	—	—	—	—	18.2	—
Victoria	59.9	334	17 23	?8	(17 23)	-59	—	22.8
Honolulu	72.7	295	—	—	(22 10)	+72	22.2	27.2
Uccle	93.8	39	—	—	—	—	e 42.2	—
De Bilt	94.3	38	—	—	—	—	e 42.2	47.3

De Bilt gives also eLN = $+46.2$ m.
MN = $+13.3$ m.

Tacubaya readings increased by 10m.,

Sept. 1d. 10h. 33m. 0s. Epicentre $35^{\circ}5$ N. $6^{\circ}4$ W.

A = $-.809$, B = $-.091$, C = $+.581$; D = $-.111$, E = $-.994$;
G = $+.577$, H = $-.065$, K = $-.814$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
San Fernando N.	1.0	10	2 12	?	—	—	—	3.0
Granada	2.8	53	0 46	+ 2	1 20	+ 3	—	—
Coimbra	5.0	342	c 1 16	- 1	4 16	?	4.9	—
Tortosa	7.6	44	3 26	?8	(3 26)	0	4.6	5.1
Algiers	7.8	77	1 59	+ 1	3 30	- 1	4.2	4.5
Barcelona	9.0	46	—	—	—	—	e 5.2	6.1
Paris	14.8	23	—	—	—	—	e 8.0	9.0
Rocca di Papa	16.1	61	—	—	(e 5 48)	-69	e 5.8	11.0
Kew	16.5	13	—	—	—	—	—	15.0
Strasbourg	16.7	34	—	—	—	—	e 9.0	—
Uccle	17.2	24	—	—	—	—	e 9.0	—
De Bilt E.	18.5	23	—	—	—	—	e 10.3	10.9
N.	18.5	23	—	—	—	—	e 10.6	12.8
Eskdalemuir	19.9	5	—	—	—	—	9.0	—
Hamburg	21.4	27	—	—	(e 9 0)	+ 7	e 9.0	—
Helwan	32.1	89	19 0	?L	—	—	(19.0)	—

Additional readings: Coimbra gives P = $+2$ m.56s.
and gives S = $+4$ m.23s.

Tortosa records S as P

Sept. 1d. Readings also at 0h. (Rio Tinto), 5h. (La Paz), 11h. (Apia), 12h. (Manila), 15h. (La Paz and Stonyhurst), 16h. (Taihoku), 17h. (La Paz), 18h. (Apia), 21h. (Padova, San Fernando, Strasbourg, and Vienna).

Sept. 2d. Readings at 0h. (near Rocca di Papa and Pompeii), 3h. (La Paz), 11h. (Helwan), 18h. (Manila), 19h. (San Fernando).

Sept. 3d. Readings at 1h. (Taihoku), 2h. (Edinburgh, Stonyhurst, Helwan, De Bilt, and Apia), 3h. (Paris, Strasbourg, Honolulu, and near Rocca di Papa), 4h. (Uccle, Edinburgh, Stonyhurst, Eskdalemuir, De Bilt, and Chicago), 5h. (Helwan), 6h. and 7h. (La Paz), 16h. (near Balboa Heights), 17h. (La Paz), 19h. (De Bilt, Uccle, Helwan, Strasbourg, Hamburg, Manila, San Fernando, Batavia, and Vienna), 20h. (Paris).

1920. Sept. 4d. 14h. 8m. 55s. Epicentre 51°0S. 3°0E.

(adopted from De Bilt).

A = +.628, B = +.033, C = -.777 ; D = +.052, E = -.999 ;
G = -.776, H = -.041, K = -.629.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Cape Town		20.5	39	(5 47)	+60	5 47	?P	9.3	11.3
Mauritius		52.6	75	15 35	?	23 47	?	—	24.7
Seychelles		63.8	62	18 35	?S	(18 35)	-36	28.1	29.6
		63.8	62	18 25	?S	(18 25)	-46	—	—
La Paz		65.4	274	i 10 48	+ 1	19 30	0	31.2	32.7
Perth		78.2	127	—	—	28 5	?SR ₁	—	—
Helwan		84.7	24	19 35	?	(23 5)	-11	—	46.0
Colombo		87.2	75	23 5	?S	(23 5)	-38	43.1	53.1
San Fernando		87.8	353	24 20	?S	(24 20)	+30	45.6	54.1
Algiers		87.8	0	—	—	—	e 40.1	52.1	—
Granada		88.3	355	i 13 4	-3	i 23 54	- 1	—	—
Kodaikanal		88.4	70	38 11	?	—	—	42.1	47.7
Rio Tinto		89.1	353	31 5	?SR ₁	—	—	—	60.1
Athens	E.	90.8	15	e 13 21	+ 1	24 43	+21	e 39.6	52.3
	N.	90.8	15	e 13 26	- 6	24 51	+29	e 46.6	52.2
Coimbra	E.	91.8	351	14 39	+73	25 9	+36	43.4	47.3
	N.	91.8	351	—	—	24 59	+26	43.2	61.5
Tortosa		91.9	358	14 48	+82	24 54	+20	e 33.1	56.2
Azores		92.2	338	65 53	?L	—	—	(65.9)	—
Pompeii	E.	92.2	9	15 5	+97	—	—	46.1	54.1
Barcelona		92.5	0	—	—	e 24 47	+ 7	e 39.3	51.3
Rocca di Papa	N.	93.2	6	e 14 4	+31	—	—	e 44.8	57.6
		93.2	6	e 13 57	+24	e 26 47	+120	45.8	59.6
Batavia		93.7	103	i 15 4	+88	i 24 39	-14	e 39.1	—
Moncalieri		96.0	3	15 14	+85	26 15	+59	42.4	60.0
Strasbourg		99.7	3	e 17 17	+188	e 33 5	?	e 48.1	58.0
Paris		99.8	359	e 22 28	?	32 59	?	43.1	59.1
Vienna		99.9	9	e 13 23	-47	e 27 17	+82	e 49.1	64.1
Uccle		101.8	1	—	—	e 24 59	-74	41.1	55.7
Lemberg		102.4	14	—	—	e 26 5	-14	e 51.0	55.7
Kew		102.5	358	46 5	?L	—	—	(46.1)	75.1
Oxford		102.8	357	—	—	—	—	—	61.2
De Bilt		103.1	1	e 16 17	+111	e 27 43	+78	49.1	58.6
Bidston		104.6	357	26 17	?S	(26 17)	-21	—	59.4
Sinla		104.8	57	—	—	e 29 17	+157	—	56.4
Hamburg		104.8	3	19 29	?PR ₁	—	—	e 51.1	57.1
Stonyhurst		105.0	357	e 35 17	?SR ₁	e 42 5	?	56.8	62.6
Edinburgh		108.0	357	—	—	e 28 5	+55	54.1	59.8
Dyce	N.	108.3	358	—	—	—	—	51.5	58.1
Harvard		113.4	310	13 15	-118	21 34	?PR ₁	57.4	—
Ottawa		117.9	310	20 22	?SR ₁	30 21	?	e 48.1	—
Toronto		118.5	306	63 59	?L	70 47	?	78.6	80.6
Chicago		121.6	299	21 9	?PR ₁	31 55	?	50.8	—
Victoria		146.0	289	49 7	?	—	—	—	84.0

Additional readings: Cape Town gives P = 14h.4m.42s. This has been corrected by 10m., making it exactly equal to the S reading; it now seems to be a possible P, although 1m. out. Mauritius PE = +14m.47s. Seychelles reading given at 15h. La Paz MN = -31.2m. T₀ = 14h.8m.59s. Helwan MN = -52.0m. Colombo S = 30m.5s. San Fernando MN = -48.6m. Algiers MN = -58.1m. Athens PR₁E = +17m.25s., PR₂N = +19m.27s. T₀ = 14h.8m.41s. Coimbra SR₁N = -31m.9s. T₀ = 14h.11m.11s. Rocca di Papa PR₁E = +17m.9s., PR₁N = +18m.13s., eL = +33.0m., MN = +55.4m. Moncalieri MN = +56.6m. Strasbourg MN = +59.7m. Paris MN = +56.1m. Uccle SR₁ = +33m.35s., MN = +51.8m. De Bilt MN = +52.1m. Epicentre 51°0S. 3°0E. Bidston gives S = +34m.17s. ?SR₁. Hamburg MZ = +59.3m., MN = +61.9m. Dyce ME = +61.7m. Harvard e = +26m.1s., eLE = +46.2m., LE = +84.5m., LN = +85.2m., T₀ = 14h.8m.30s. Ottawa LE = +58.1m., +71.1m., +81.1m., +91.1m., and +96.1m., T₀ = 14h.17m.16s. Toronto i = +67m.35s.

Sept. 4d. Readings also at 2h. (Riverview), 3h. (Apia), 9h. (La Paz), 11h. (2), 12h. (2), 13h., 14h. (2) (Stonyhurst), 16h. (Ann Arbor and La Paz), 18h. (near Rocca di Papa), 19h. (Rio Tinto), 20h. (Helwan and near Tokyo), 22h. (Apia), 23h. (near Mizusawa).

Sept. 5d. Readings at 2h. (La Paz), 3h. (Helwan), 4h. and 7h. (La Paz), 12h. (Taihoku), 14h. (Manila), 20h. (near Tacubaya), 21h. (San Fernando).

Sept. 6d. 4h. 40m. 30s. Epicentre $36^{\circ}0'N$. $139^{\circ}0'E$. (as on 1919 Jan. 24d.).

$$A = -.611, B = +.531, C = +.588.$$

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo		0.8	0 14	+ 2	—	—	0.4	0.5
Osaka		3.2	—	—	1 48	+20	2.8	3.6
Mizusawa	E.	3.5	0 50	- 5	1 23	-14	—	—
	N.	3.5	0 48	- 7	1 17	-20	—	—

Tokyo gives also $MN = +0.6m$.

Sept. 6d. 6h. 29m. 10s. Epicentre $35^{\circ}0'N$. $24^{\circ}0'E$. (as on 1918 Sept. 30d.).

$$A = +.748, B = +.333, C = +.574.$$

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens		2.9	0 43	- 2	1 20	0	1.4	1.5
Pompeii		9.4	e 2 41	+19	—	—	—	—
Rocca di Papa		11.1	e 2 49	+ 3	e 4 38	-19	e 6.0	—
De Bilt		21.7	—	—	—	—	e 12.0	13.2

Athens gives also $MN = +1.6m$.

Sept. 6d. 14h. 5m. 24s. Epicentre $43^{\circ}8'N$. $11^{\circ}2'E$. Florence (as on 1920 Mar. 8d.).

$$A = +.708, B = +.140, C = +.692; \quad D = +.194, E = -.981;$$

$$G = +.679, H = +.134, K = -.722.$$

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Florence		0.0	—	0 13	+13	—	—	—	0.8
Padova		1.7	17	0 19	- 7	0 39	- 9	—	—
Rocca di Papa		2.3	152	i 0 57	?S	2 18	? e 8.4	—	—
		2.3	152	i 0 54	?S	(i 0 54)	- 9	1.9	2.2
Moncalieri		2.8	295	0 40	- 3	1 7	-10	—	1.6
		2.8	295	0 43	- 1	1 9	- 8	—	1.7
Pompeii	E.	3.9	142	1 19	+18	2 22	?L	(2.4)	3.9
Zurich	E.	4.0	332	1 1	- 1	i 1 51	+ 1	—	2.5
	N.	4.0	332	1 1	- 1	i 1 57	+ 7	—	2.2
	Z.	4.0	332	1 1	- 1	i 2 3	+13	—	2.1
Besançon		5.0	316	1 13	- 4	1 52	-15	2.6	—
Strasbourg		5.3	334	i 1 15	- 7	2 6	-19	2.5	3.3
Vienna	V.	5.7	37	e 1 30	+ 2	i 1 55	-41	i 2.3	3.6
		5.7	37	e 1 33	+ 5	2 0	-36	i 2.9	4.2
Barcelona		7.0	254	1 48	+ 2	—	—	4.2	4.9
Paris		7.8	313	e 1 59	+ 1	—	—	3.9	4.6
Uccle		8.4	329	e 2 18	+11	e 3 49	+ 2	i 4.5	—
Tortosa		8.4	253	2 8	+ 1	3 41	- 6	4.0	5.7
De Bilt		9.2	336	—	—	e 3 58	-10	4.6	6.2
Algiers		9.3	224	—	—	—	—	e 4.6	7.1
Hamburg		9.8	356	e 2 24	- 3	—	—	e 4.6	6.7
Lemberg		10.7	51	—	—	—	—	e 5.9	8.3
Kew		10.8	319	—	—	—	—	—	6.6
Oxford		11.5	318	2 46	- 6	5 1	- 6	5.7	8.1
Granada		13.0	244	3 10	- 3	5 34	-10	—	—
Bidston		13.4	321	2 48?	? e 6 18	+25	—	—	8.2
Rio Tinto		14.7	252	14 36	? e 6 36	+ 9	—	—	16.1
Esksdalemuir		14.8	326	—	—	—	—	—	—
Coimbra		15.0	263	e 4 20	+41	e 7 4	+32	8.1	9.9
San Fernando		15.2	247	3 54	+12	—	—	—	11.1
Edinburgh		15.3	328	—	—	6 36	- 3	—	8.6
Helwan		21.2	124	10 36	?L	—	—	(10.6)	—

Additional readings: Florence gives also $P = +24s$. and $+26s$. Padova readings have been corrected by $+1m$. Zurich gives $iPEN = +1m.11s.$, $iPZ = +1m.9s.$, $iZ = +1m.18s.$ and $+1m.35s.$, $iN = +1m.42s.$, $iE = +1m.36s.$ Strasbourg (P) = $+1m.39s.$, $MN = +3.0m.$, $T_0 = 14h.5m.36s.$ Hamburg $MZ = +6.4m.$, $MN = +6.9m.$ Lemberg $e = +7m.54s.$ Coimbra $LN = +8.4m.$, $MN = +8.6m.$, $T_0 = 14h.6m.22s.$ San Fernando $MN = +11.6m.$

Sept. 6d. 23h. 16m. 50s. Epicentre $48^{\circ}4'N$, $150^{\circ}4'E$.

$$A = -.577, B = +.328, C = +.748; \quad D = +.494, E = +.870; \\ G = -.650, H = +.369, K = -.664.$$

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Mizusawa	E.	11.4	219	2 45	- 5	4 59	- 5	—	—
	N.	11.4	219	2 58	+ 8	4 58	- 6	—	—
Nagoya		16.5	222	3 59	0	—	—	—	—
Osaka		17.6	224	4 13	+ 1	—	—	5.0	5.1
Hamburg		72.7	338	e 11 28	- 6	—	—	e 41.2	52.2
Eskdalemuir		74.0	347	—	—	—	—	38.2	—
Stonyhurst		75.2	345	46 10	?L	51 22	?	57.4	—
De Bilt		75.3	340	—	—	21 33	- 4	e 40.2	44.9
Vienna		75.5	331	i 11 46	- 6	—	—	—	53.2
Bidston		75.7	345	46 58	?L	49 34	?	(47.0)	52.2
Uccle		76.6	340	e 11 46	-13	e 21 40	- 4	e 40.2	—
Strasbourg		77.8	337	e 12 10	+ 4	—	—	e 46.2	—
Paris		78.9	340	—	—	—	—	46.2	—
Moncalieri		81.0	335	e 16 37	?	23 31	+56	47.4	—
Rocca di Papa	N.	82.4	330	e 12 16	-16	—	—	—	12.7
		82.4	330	e 12 28	- 4	—	—	e 48.8	—
Helwan		84.7	312	44 10	?L	—	—	(44.2)	—
La Paz		135.3	58	19 16	[-15]	—	—	—	—

De Bilt gives MN = +56.4m. Helwan PN = +47m.10s.

Sept. 6d. Readings also at 1h. (La Paz), 4h. (Colombo), 11h. (Stonyhurst), 12h. (Dyce and Stonyhurst), 13h. and 14h. (Stonyhurst), 15h. (Stonyhurst, Zi-ka-wei, and near Taihoku), 16h. (Stonyhurst and Taihoku), 17h. (Padova, Vienna, and Manila), 18h. (Taihoku and Florence), 19h. (Strasbourg), 21h. (Kodaikanal).

1920. Sept. 7d. 5h. 55m. 40s. Epicentre $43^{\circ}8'N$, $11^{\circ}2'E$.

(as on 1920 Sept. 6d.).

$$A = +.708, B = +.140, C = +.692; \quad D = +.194, E = -.981; \\ G = +.679, H = +.134, K = -.722.$$

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Florence		0.0	—	0 20	+20	—	—	—	—
Padova		1.7	17	0 17	- 9	0 39	- 9	—	—
Milan		2.3	320	—	—	1 40	+37	(1.7)	—
Rocca di Papa		2.3	152	i 0 53	?S	(i 0 53)	-10	e 9.9	—
Moncalieri		2.8	295	0 41	- 3	1 10	- 7	—	7.0
		2.8	295	i 0 40	- 4	1 10	- 7	—	1.4
Chur		3.2	338	e 0 50	0	i 1 33	- 5	—	—
Pompeii		3.9	142	1 21	+20	—	—	2.3	3.0
Zurich	E.	4.0	332	e 0 57	- 5	i 1 42	- 8	—	2.3
	N.	4.0	332	e 0 55	- 7	i 1 34	-16	—	2.0
	V.	4.0	332	e 0 57	- 5	i 1 43	- 7	—	2.3
Neuchatel		4.4	318	1 6	- 2	1 52	- 9	—	—
Besançon		5.0	316	1 14	- 3	1 40	-37	2.3	—
Strasbourg		5.3	334	i 1 18	- 4	2 11	-14	—	4.9
Vienna	E.	5.7	37	e 1 33	+ 5	2 9	-27	—	3.7
	N.	5.7	37	e 1 34	+ 6	i 1 49	-47	—	3.9
	Z.	5.7	37	e 1 30	+ 2	i 1 55	-41	—	3.7
Barcelona		7.0	254	i 1 42	- 4	3 13	+ 3	4.4	5.2
Paris		7.8	313	i 1 51	- 7	e 3 13	-18	3.9	4.3
Tortosa		8.4	253	2 0	- 7	3 37	-10	3.8	6.0
Uccle		8.4	329	1 59	- 8	i 3 37	-10	i 4.3	—
De Bilt		9.2	336	2 18	- 1	4 3	- 5	4.3	5.6
Algiers		9.3	224	2 20	0	4 18	+ 8	4.8	6.8

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Hamburg	E.	9.8	356	i 2 31	+ 4	e 4 31	+ 8	—	—
	N.	9.8	356	i 2 29	+ 2	i 4 36	+13	—	—
	Z.	9.8	356	i 2 26	- 1	i 4 39	+16	—	—
Lemberg		10.7	51	e 2 56	+16	i 5 17	+29	e 6.9	8.2
Kew		10.8	316	3 20	+39	—	—	—	6.3
Athens		11.2	117	e 2 56	+ 9	4 59	0	5.4	9.0
Oxford		11.5	318	2 39	-13	i 4 42	-25	5.5	6.8
West Bromwich		12.4	320	2 50	-15	4 55	-34	—	—
Granada		13.0	244	3 10	- 3	5 34	-10	—	—
Stonyhurst		13.4	323	3 20	+ 2	5 20	-33	6.8	7.8
Bidston		13.4	321	3 8	-10	5 44	- 9	—	8.5
Rio Tinto		14.7	252	9 20	?L	—	—	(9.3)	16.3
Eskdalemuir		14.8	326	3 23	-13	6 2	-25	—	8.8
Coimbra	E.	15.0	263	3 27	-12	6 10	-22	7.9	10.0
	N.	15.0	263	—	—	—	—	7.4	8.7
San Fernando		15.2	247	3 32	-10	6 38	+ 1	8.7	9.3
Edinburgh		15.3	328	3 31	- 9	6 8	-31	—	8.8
Dyce	E.	15.8	333	i 3 43	- 6	6 41	- 9	8.1	11.2
	N.	15.8	333	i 3 39	-10	6 41	- 9	8.2	11.2
Helwan		21.2	124	5 20	+25	—	—	—	—
Simla		52.5	80	—	—	—	—	e 26.7	—
Harvard	E.	57.5	300	e 10 42	+46	17 46	- 7	e 27.4	—
Ottawa		57.6	307	10 1	+ 5	18 1	+ 7	e 27.5	—
Toronto		61.8	307	—	—	—	—	e 35.6	37.7
Washington		63.2	300	—	—	—	—	e 36.3	—
Georgetown		63.2	300	—	—	—	—	e 30.3	—
Chicago		67.7	309	19 50	?S	(19 50)	- 8	32.2	—
Colombo		69.8	101	40 20	?L	—	—	(40.3)	—
Cape Town		77.8	174	40 2	?L	—	—	(40.0)	52.3
Victoria		79.5	331	32 31	?	—	—	39.4	44.1
Zi-ka-wei		81.7	54	—	—	e 22 40	- 3	—	—
Manila		93.6	67	—	—	e 26 20	+88	—	—
La Paz		93.9	253	e 13 26	-11	24 51	- 4	46.4	54.3
Batavia		98.2	91	i 52 9	?L	—	—	(i 52.2)	52.6

Additional notes and readings: Florence gives $P = +30s$. Padova gives its readings 1m. early. Moncalieri $MN = +2.5m$. Chur $iP = +0m.52s$. Zurich $iN = +1m.10s$, $iE = +1m.14s$, $iV = +1m.12s$, and $+1m.20s$. Vienna $iPZ = +1m.35s$, $iPE = +1m.38s$, $iPN = +1m.39s$, $i_2N = +1m.58s$, $i_2Z = +2m.7s$, $i_3N = +2m.11s$. Epicentre $44^{\circ}1'N$, $10^{\circ}1'E$. Paris $MN = +5.3m$. De Bilt $MN = +6.5m$, $T_0 = 5h.55m.50s$. Hamburg $iZ = +3m.14s$, $iE = +3m.25s$. Coimbra $iE = +6m.39s$, $T_0 = 5h.55m.56s$. San Fernando $MN = +10.8m$, $T_0 = 5h.55m.24s$. Harvard $i = +11m.9s$, $L = +33.3m$, $T_0 = 5h.55m.44s$. Ottawa $LE = +34.3m$, and $+46.3m$. $T_0 = 5h.55m.44s$. Chicago $S = +26m.20s$. Zi-ka-wei reading has been corrected by $-10m$. Basel (actual position uncertain) gives $S = +2m.1s$.

Sept. 7d. 8h. 11m. 0s. Epicentre $43^{\circ}8'N$, $11^{\circ}2'E$. (as at 5h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Florence	6.0	—	0 8	+ 8	—	—	—	0.6
Padova	1.7	17	0 17	- 9	0 39	- 9	—	—
Rocca di Papa	2.3	152	i 0 48	+12	—	—	—	2.4
Moncalieri	2.8	295	0 46	+ 2	1 10	- 7	—	1.6
Pompeii	3.9	142	1 31	-30	(1 31)	-16	—	—
Zurich	4.0	332	e 0 57	- 5	i 1 45	- 5	—	2.2
	4.0	332	i 1 16	-14	i 1 52	+ 2	—	—
Besançon	5.0	316	1 14	- 3	2 0	-17	—	—
Strasbourg	5.3	334	e 1 12	-10	e 2 3	-22	e 2.4	2.9
Vienna	5.7	37	1 28	0	2 34	- 2	2.8	4.2
Paris	7.8	313	e 1 59	+ 1	e 3 20	-11	4.2	5.0
Uccle	8.4	329	e 2 21	+14	—	—	e 4.3	—
De Bilt	9.2	336	—	—	—	—	e 6.2	—
Hamburg	9.8	356	—	—	e 3 18	-65	e 4.9	6.7

Additional readings and notes: Florence gives also $P = +12s$. Padova readings have been increased by 1m. Vienna $MN = +3.4m$. Hamburg $MN = -5.6m$.

Sept. 7d. 10h. 14m. 50s. Epicentre $43^{\circ}8'N$. $11^{\circ}2'E$. (as at 8h.).

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 12	+12	—	—	—	0.6
Padova	1.7	17	0 24	- 2	0 45	- 3	—	—
Rocca di Papa	2.3	152	e 0 4	-32	—	—	—	1.7
Moncalieri E.	2.8	295	0 45	+ 1	—	—	1.3	—
Pompeii	3.9	142	2 10	?L	—	—	(2.2)	—
Zurich E.	4.0	332	e 1 1	- 1	—	—	—	—
Strasbourg	5.3	334	e 1 23	- 1	—	—	—	—
Vienna	5.7	37	1 57	+29	2 50	+14	—	3.5
Hamburg	9.8	356	—	—	e 4 10	-13	—	—

Additional readings: Florence gives $P = +20s.$ and $+34s.$ Padova gives its readings 1m. early. Rocca di Papa $iP = +10s.$ Zurich $eN = +1m.3s.$

Sept. 7d. 11h. 26m. 25s. Epicentre $43^{\circ}8'N$. $11^{\circ}2'E$. (as at 10h.).

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 27	+27	—	—	—	0.7
Padova	1.7	17	0 28	+ 2	0 49	+ 1	—	—
Rocca di Papa	2.3	152	e 1 11	?L	—	—	(e 1.2)	2.2
Moncalieri	2.8	295	—	—	e 1 18	+ 1	—	—
Pompeii	3.9	142	3 6	?	—	—	—	—
Zurich E.	4.0	332	e 1 12	+10	e 1 32	-18	i 1.8	—
N.	4.0	332	e 1 7	+ 5	e 1 28	-22	i 1.8	—
Strasbourg	5.3	334	e 2 5	?S	(2 5)	-20	—	—
Vienna	5.7	37	e 2 35	?S	(e 2 35)	- 1	—	—
Hamburg	9.8	356	—	—	e 4 35	+12	—	—

Additional readings: Florence gives also $P = +0m.46s.$ Padova gives its readings 1m. early.

Sept. 7d. 13h. 32m. 20s. Epicentre $43^{\circ}8'N$. $11^{\circ}2'E$. (as at 11h.).

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 10	+10	—	—	—	0.6
Padova	1.7	17	0 24	- 2	0 46	- 2	—	—
Rocca di Papa	2.3	152	i 0 55	+19	(i 0 55)	- 8	—	2.7
Moncalieri	2.8	295	0 39	- 5	1 3	-14	—	1.5
	2.8	295	0 40	- 4	1 7	-10	—	1.6
Pompeii	3.9	142	1 40	?S	(1 40)	- 7	—	—
Zurich v.	4.0	332	e 1 3	+ 1	i 1 42	- 8	—	2.3
	4.0	332	e 0 59	- 3	i 1 43	- 7	—	—
Besançon	5.0	316	2 0	?S	(2 0)	-17	2.7	—
Strasbourg	5.3	334	e 1 22	0	—	—	e 2.5	—
Vienna	5.7	37	1 42	+14	—	—	—	3.4
Uccle	8.4	329	e 2 49	+42	—	—	e 4.5	—
Hamburg	9.8	356	e 2 40	+13	—	—	i 5.4	7.3
Bidston	13.4	321	7 22	?L	—	—	(7.4)	10.5

Additional readings: Florence gives $P = +17s.$ and $+23s.$ Padova gives its readings 1m. early. Moncalieri $MN = +1.8m.$ Vienna $MN = +3.7m.$ Hamburg $MN = +7.5m.$

Sept. 7d. 18h. 42m. 43s. Epicentre $43^{\circ}8'N$. $11^{\circ}2'E$. (as at 13h.).

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 17	+17	—	—	—	0.6
Padova	1.7	17	0 30	+ 4	0 51	+ 3	—	—
Milan	2.3	320	0 36	0	—	—	—	1.0
Rocca di Papa	2.3	152	e 0 59	?S	(e 0 59)	- 4	(1.5)	2.3
Moncalieri	2.8	295	0 42	- 2	1 17	0	—	—
Pompeii	3.9	142	2 17	?L	—	—	(2.3)	—
Zurich E.	4.0	332	e 1 2	0	i 1 45	- 5	—	2.1
Strasbourg	5.3	334	e 1 17	- 5	—	—	—	—
Vienna	5.7	37	1 36	+ 8	—	—	—	3.7
Uccle	8.4	329	—	—	—	—	e 4.4	—
De Bilt	9.2	336	—	—	—	—	e 5.2	5.7
Hamburg	9.8	356	—	—	e 3 53	-30	—	7.5

Additional readings: Florence gives $P = +23s.$ and $M = +0.8m.$ Padova gives its readings 1m. early. Rocca di Papa $PR_1N = +1m.29s.$ (?!L). Zurich $MN = +2.0m.$ De Bilt $eLN = +6.2m.$

Sept. 7d. Other shocks, probably from this origin, not entered in the tables.
The phase recorded is in each case the first given—usually P.

Florence	Padova	Rocca di Papa	Moncalieri	Zurich
h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
6 7 7	—	—	—	—
6 34 25	6 34 35	6 34 42	—	—
—	—	—	—	7 45 11
—	—	—	—	7 51 54
8 15 27	—	—	—	—
8 25 35	—	—	—	—
8 28 30	8 28 33	8 29 12	8 29 17	8 29 52
8 40 37	—	—	—	—
8 48 6	8 48 28	8 49 6	8 48 58	8 49 29
8 52 5	—	8 53 12	—	—
9 1 22	9 1 30	9 1 54	—	9 2 14
9 14 0	—	—	—	—
9 45 50	—	—	—	—
9 53 34	9 53 47	9 53 54	—	—
10 27 17	—	—	10 54 16	—
—	—	—	—	—
13 35 16	—	—	—	—
13 36 35	—	—	—	—
15 46 52	—	—	—	—
16 14 15	16 14 39	16 14 48	—	—
—	—	16 42 6	—	—
—	—	16 48 12	—	—
17 29 36	17 29 32	—	—	—
—	18 4 53	—	18 3 20	—
—	—	18 5 36	18 5 52	18 5 42
18 18 30	—	—	—	—
19 9 0	—	—	—	—
21 7 41	—	—	—	—
23 35 38	23 36 50	23 36 33	e 23 36 26	—

Strasbourg e = 8h.30m. Vienna gives P = +7h.44m.44s. Padova, as in the tabulated shocks, has been assumed one minute in error, and the times entered are that interval later than the ones given.

Sept. 7d. 21h. 54m. 25s. Epicentre $36^{\circ}0'N$. $139^{\circ}0'E$. (as on 1920 Sept. 6d.).

A = -611, B = +531, C = +588.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	0.8	-0 13	-25	—	—	0.7	0.7
Osaka	3.2	e 0 50	0	—	—	1.9	2.7
Kobe	3.4	0 52	-1	—	—	—	2.5
Mizusawa	3.5	0 57	+ 2	2 4	+27	(2.1)	—

Kobe gives MN = +1.4m.

Sept. 7d. Readings also at 4h. (near Batavia), 7h. (near Calcutta and La Paz), 12h. (Batavia), 19h. (La Paz (2)), 20h. (near Tokyo), 21h. (Lick (2)), 22h. (La Paz), 23h. (Perth).

Sept. 8d. 1h. 19m. 14s. I }
9h. 41m. 24s. II } Epicentre $43^{\circ}8'N$. $11^{\circ}2'E$. (as on 7d.).
18h. 43m. 50s. III }

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Florence	0.0	—	-0 1	- 1	—	—	—	0.3
II	0.0	—	0 12	+12	—	—	—	0.5
III	0.0	—	-0 55	-55	—	—	—	-0.2
I Padova	1.7	17	-0 2	-28	0 19	-29	—	—
II	1.7	17	0 15	-11	0 36	-12	—	—
III	1.7	17	0 30	+ 4	0 51	+ 3	—	—
II Milan	2.3	320	0 46	+10	—	—	—	1.0
I Rocca di Papa	2.3	152	e 0 34	- 2	—	—	—	1.9
II	2.3	152	e 0 30	- 6	—	—	—	2.6
III	2.3	152	e 0 28	- 8 (e 1 1)	- 2	—	—	2.2

Continued on next page.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
I Moncalieri	2.8	295	0 30	-14	—	—	—	—
II	2.8	295	0 32	-12	0 59	-18	—	2.1
III	2.8	295	e 0 45	+ 1	1 12	- 5	—	—
II Pompeii	3.9	142	4 27	?	—	—	—	—
III	3.9	142	2 30	?L	—	—	(2.5)	—
I Zurich	4.0	332	e 0 35	-27	i 1 13	-37	—	1.6
II	4.0	332	e 0 58	- 4	i 1 32	-18	—	1.9
III	4.0	332	e 1 7	+ 5	i 1 58	+ 8	—	—
II Besançon	5.0	316	1 20	+ 3	1 56	-21	—	—
I Strasbourg	5.3	334	e 0 53	-29	—	—	—	—
II	5.3	334	e 1 12	-10	e 2 4	-21	e 2.4	—
III	5.3	334	e 1 46	-24	—	—	e 2.9	—
I Vienna	5.7	37	i 35	+ 7	e 2 38	- 2	—	3.0
II	5.7	37	e 1 30	+ 2	—	—	—	3.5
III	5.7	37	e 1 2	-26	—	—	—	3.8
I Paris	7.8	313	e 1 53	- 5	3 24	- 7	4.1	4.6
I Uccle	8.4	329	e 2 4	- 3	—	—	—	10.8
II	8.4	329	—	—	—	—	e 4.1	—
I De Bilt	E. 9.2	336	—	—	e 5 4	+56	e 7.9	9.2
I	N. 9.2	336	—	—	—	—	e 11.1	12.0
II	9.2	336	—	—	e 4 16	+ 8	e 5.0	5.4
III	9.2	336	—	—	—	—	e 5.2	—
II Hamburg	9.8	356	—	—	e 4 36	+13	—	7.2
III	9.8	356	e 2 10	-17	—	—	—	7.2
I Helwan	21.2	124	0 46	?	—	—	—	—

Additional readings: Florence gives other P's and M's slightly different from those entered. Padova readings are given 1min. early. Rocca di Papa

(I) iP = +0m.36s., PR₁ = +0m.52s. Rocca di Papa (II) ePN = +0m.42s.,
 ePE = +0m.48s. Zurich (I) ePN = +0m.32s., iPNEV = +0m.41s., MN =
 +1.5m. Zurich (II) ePNE = +0m.28s. Zurich (III) eN = +1m.8s.,
 eV = +1m.14s., iSNV = +1m.59s. Paris (II) e = +2m.53s. De Bilt
 (II) MN = +7.0m.

Sept. 8d. Additional repetitions from 43°·8N, 11°·2E., being a continuation of the table for Sept. 7d.

Florence	Padova	Rocca di Papa	Moncalieri	Zurich
h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
0 55 11	0 55 13	0 56 6	0 55 58	—
3 7 0	—	—	—	—
3 33 21	—	3 34 18	—	—
—	—	—	5 57 19	—
6 4 15	—	—	—	—
7 43 12	—	—	—	—
—	—	8 19 12	—	—
9 50 49	—	—	—	—
10 50 35	—	—	—	—
11 4 28	—	—	—	—
—	—	—	11 12 30	—
13 51 4	13 51 22	13 51 48	—	—
14 37 35	—	—	—	—
—	—	—	16 3 51	—
17 51 7	17 52 31	17 52 6	17 52 59	17 53 14
19 43 20	—	—	—	—
19 51 0	—	—	—	—
22 19 45	—	—	—	—
22 51 25	—	—	—	—
23 19 42	23 20 54	23 21 54	—	—

Padova readings are given 1min. early.
 Pompeii P = 8h.19m.11s. and 17h.55m.1s.

Strasbourg gives e = 17h.54m.

1920. Sept. 8d. 1h. 45m. 35s. Epicentre 22°0S. 180°0.

(as on 1917 May 24d.).

A = -·927, B = ·000, C = -·375; D = ·000, E = +1·000;

G = +·375, H = ·000, K = -·927.

The Japanese stations would require the origin 1·5 degree further away, but as this is the only origin in the neighbourhood the old epicentre is retained for comparison.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°		m. s.	s.	m. s.	s.	m.	m.
Apia	11·3	45	i 3 4	+15	5 3	+ 1	6·5	—
Christchurch	22·4	194	(4 45)	-25	4 45	?P	11·1	16·4
Riverview	28·0	239	i 6 5	- 3	12 5	+66	15·0	16·7
Sydney	28·0	239	6 13	+ 5	—	—	16·2	18·8
Melbourne	34·0	234	6 49	-16	—	—	17·7	23·4
Adelaide	38·3	240	i 7 43	+ 3	—	—	e 22·6	26·9
Honolulu	48·4	28	8 49	- 7	i 15 1	-58	e 21·4	31·4
Manila	68·5	297	e 11 29	+21	—	—	—	—
Tokyo	69·1	327	e 12 11	+59	e 15 46	?PR ₁	e 22·2	30·8
Osaka	70·7	322	11 43	+22	22 6	+92	34·7	37·2
Kobe	70·9	322	11 41	+19	22 31	+114	32·4	33·1
Mizusawa	E. 71·1	330	11 43	+19	—	—	30·8	—
Batavia	72·1	270	i 11 46	+15	i 20 58	+ 7	e 33·4	40·0
Nagasaki	72·7	320	11 47	+13	—	—	—	—
Taihoku	73·7	309	e 12 0	+20	—	—	e 27·3	—
Zi-ka-wei	77·3	313	e 12 17	+14	e 23 5	+73	—	—
Berkeley	E. 80·7	42	e 12 18	- 5	(e 22 16)	-15	e 22·3	—
	Z. 80·7	42	e 12 22	- 1	(e 22 12)	-19	e 22·2	—
Lick	80·9	43	e 12 23	- 1	(e 22 20)	-14	e 22·3	22·4
Tucson	E. 85·5	52	e 12 45	- 6	e 23 2	-23	—	—
	N. 85·5	52	12 47	- 4	i 23 3	-22	—	—
Victoria, B.C.	86·7	34	(13 12)	+15	(23 3)	-35	e 29·6	32·4
Tacubaya	E. 89·1	70	13 1	-10	24 23	+19	—	—
	N. 89·1	70	13 5	- 6	23 26	-38	—	—
Colombo	102·0	273	18 25	?PR ₁	20 25	?	—	77·4
La Paz	102·9	114	14 8	-17	i 24 18	-125	39·5	44·1
Kodaikanal	105·3	275	20 19	?PR ₁	(26 13)	-32	26·2	30·0
Chicago	106·2	51	14 12	-28	24 25	-149	41·3	—
Ann Arbor	E. 109·1	51	18 43	?PR ₁	25 25	-115	45·5	—
	N. 109·1	51	—	—	25 7	-133	45·3	—
Mauritius	N. 109·5	239	26 25	?S	(26 25)	-59	—	47·8
	E. 109·5	239	24 25	?	—	—	—	47·9
Simla	111·7	298	e 19 7	?PR ₁	—	—	—	—
Toronto	112·5	50	—	—	26 31	-79	66·4	72·2
Georgetown	E. 113·4	56	e 20 58	?PR ₁	26 10	-107	59·7	—
	N. 113·4	56	e 20 41	?PR ₁	26 19	-98	—	—
Washington	113·4	56	18 25	[- 7]	27 21	-36	—	—
Cheltenham	N. 113·5	56	25 9	?S	35 10	?SR ₁	—	—
Ithaca	114·4	51	—	—	e 26 45	-80	—	—
Ottawa	115·4	49	—	—	27 23	-50	e 47·4	—
Harvard	118·3	52	e 19 17	?PR ₁	25 32	-184	65·5	—
Porto Rico	118·9	81	—	—	29 31	+50	—	—
Cape Town	121·4	199	27 38	?S	(27 38)	-82	—	89·6
Dyce	E. 144·8	3	i 19 51	[+ 3]	—	—	41·9	—
	N. 144·8	3	i 19 49	[+ 1]	i 33 25	?	53·0	—
Edinburgh	146·0	3	i 19 55	[+ 5]	—	—	—	42·2
Lemberg	146·4	332	e 20 1	[+11]	—	—	—	35·6
Eskdalemuir	146·6	4	19 49	[- 2]	33 26	?	44·4	—
Hamburg	147·5	350	19 50	[- 2]	i 31 46	?	e 72·4	74·4
Stonyhurst	148·1	3	20 13	[+20]	—	—	42·4	42·9
De Bilt	149·7	354	19 56	[+ 1]	e 31 44	?	—	95·7
Oxford	150·3	2	20 1	[+ 5]	—	—	—	43·1
Kew	150·6	0	24 25	?PR ₁	—	—	—	44·4
Vienna	150·7	337	i 19 55	[- 2]	32 4	?	53·4	84·9
Uccle	151·0	353	i 19 55	[- 2]	—	—	43·4	53·6
Strasbourg	152·8	349	i 19 55	[- 5]	e 32 13	?	e 63·4	—
Paris	153·2	356	e 19 59	[- 1]	i 32 7	?	52·1	65·4
Zurich	153·7	347	e 20 2	[+ 1]	—	—	—	—
Athens	154·1	313	e 20 0	[- 1]	37 22	?	e 45·9	—
Besançon	154·4	351	19 54	[- 7]	(30 25)	?	30·4	—
Padova	154·7	340	19 49	[+ 13]	30 7	?	—	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Moncalieri	156.2	346	19 59	[- 4]	35 49	?	51.7	—
Florence	156.3	339	20 43	[+39]	—	—	—	21.2
Pompeii	157.6	330	20 16	[+10]	—	—	—	—
Rocca di Papa	157.6	335	i 20 5	[- 1]	28 13	?	e 48.0	—
Coimbra	E. 160.5	19	20 6	[- 2]	—	—	51.0	—
	N. 160.5	19	20 8	[0]	32 0	?	50.8	—
Barcelona	160.5	355	e 20 11	[- 3]	—	—	e 49.2	—
Tortosa	161.2	359	20 6	[- 3]	30 51	?	51.9	58.3
Rio Tinto	163.3	18	26 25	?	—	—	—	52.4
Granada	164.5	11	i 20 14	[+ 2]	35 10	?	—	—
San Fernando	164.6	19	20 15	[+ 3]	—	—	—	53.9
Algiers	165.0	351	e 19 55	[-17]	25 5	?	29.4	47.4

Additional readings: Christchurch gives $SR_1 = +6m.49s.$. Riverview gives its readings 1h. late, $PR_1 = +6m.25s.$, $PS = +13m.7s.$, $MN = +16.1m.$, $MZ = +16.5m.$, $T_0 = 2h.44m.0s.$, $24^{\circ}08.$, $163^{\circ}5W.$. Melbourne $PR_1 = +7m.43s.$, $SR_1 = +14m.55s.$. Adelaide $i = +8m.55s.$ and $+10m.25s.$, $e = +15m.1s.$. Osaka $MN = +37.6m.$. Batavia $i = +15m.22s.$ and $+62m.44s.$. Lick $e?E = +22m.39s.$. Victoria gives its P as S and its S as L. Chicago $PR_1 = +17m.56s.$, $PR_2 = +19m.56s.$, $SR_1 = +33m.15s.$, $T_0 = 1h.47m.32s.$. Toronto $L = +29.3m.$, $eL = +67.5m.$. Georgetown $iE = +25m.7s.$, $iN = +35m.9s.$, $eLE = +35.9m.$. Washington $PR_1 = +21m.45s.$. Ithaca $e = +34m.34s.$. Ottawa $PR_1N? = +19m.50s.$, $eE = +20m.52s.$, $iE = +25m.16s.$, and $+26m.25s.$. Harvard $iE = +20m.37s.$, $eLE = +47.0m.$, and a number of other readings. Also $T_0 = 1h.46m.17s.$. Epicentre $20^{\circ}08.$, $153^{\circ}0W.$. Porto Rico $ePR_1N = +20m.59s.$, $ePR_1E = +21m.17s.$. Dyce $LE = +43.4m.$. Hamburg $eE = +42m.28s.$, $MZ = +94.4m.$. De Bilt $ePR_1 = +23m.29s.$, $MN = +89.4m.$. Vienna $ePN = +19m.57s.$, $iPN = +19m.58s.$, $SN = +32m.5s.$, $ME = +97.9m.$. Uccle $PR_1 = +23m.45s.$, $MN = +55.0m.$. Paris $i = +20m.27s.$, $PR_1 = +23m.58s.$, $i = +34m.24s.$, $MN = +80.4m.$. Athens $ePR_1 = +24m.18s.$. Padova readings are given 1m. early. Rocca di Papa $PR_1 = +20m.49s.$. Coimbra $PR_1E = +24m.38s.$, $PR_1N = +25m.18s.$, $iN = +25m.46s.$, $PR_2E = +29m.48s.$, $iN = +36m.18s.$, $iNE = +44m.33s.$, $iE = +46m.18s.$. Granada $SR_1 = +45m.9s.$

Sept. 8d. Readings also at 0h. (La Paz), 2h. (Taihoku), 9h. (Besançon and Manila), 10h. (La Paz), 16h. (Mizusawa), 21h. (San Fernando and Taihoku), 22h. (Lick).

1920. Sept. 9d. 18h. 56m. 0s. Epicentre $15^{\circ}0S.$ $171^{\circ}5E.$

A = - .955, B = + .143, C = - .259; D = + .148, E = + .989;
G = + .256, H = - .038, K = - .966.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	26.3	221	e 5 47	- 4	i 10 41	+13	e 12.7	13.0
Sydney	26.3	221	5 48	- 3	(10 54)	+26	10.9	13.2
Christchurch	28.5	178	—	—	20 54	?	(15.8)	29.5
Melbourne	32.7	221	7 0	+ 6	12 30	+11	16.8	18.0
Adelaide	35.6	230	e 7 12	- 6	i 12 48	-16	e 17.5	23.0
Honolulu	47.1	41	e 8 48	0	e 16 18	+36	e 25.0	30.8
Manila	58.1	299	e 9 35	-25	—	—	—	—
Osaka	60.3	328	10 24	+10	18 28	+ 1	27.3	30.4
Kobe	60.5	328	e 10 50	+34	—	—	27.0	30.6
Mizusawa	E. 61.1	335	10 18	- 2	18 17	-20	—	—
	N. 61.1	335	10 29	+ 9	17 57	-40	—	—
Taihoku	63.0	311	e 10 40	+ 8	—	—	27.6	31.5
Batavia	63.9	272	i 10 22	-15	—	—	e 26.4	29.4
Zi-ka-wei	66.6	317	e 10 45	-10	e 19 13	-32	—	—
Ootomari	66.8	340	10 47	-10	—	—	29.4	30.8
Berkeley	81.4	47	e 13 1	+34	—	—	e 38.0	—
Lick	81.7	48	—	—	—	—	e 41.2	—
Victoria	85.7	38	13 11	+19	23 1	-26	35.8	41.2
Colombo	93.4	277	12 0	-94	—	—	—	79.0
Kodaikanal	96.5	280	17 6	?PR ₁	—	—	57.6	63.2
Simla	101.3	300	—	—	e 24 54	-74	—	53.9
Mauritius	E. 105.9	243	14 6	-33	—	—	—	57.8
Chicago	108.0	50	28 54	?S	(28 54)	+104	42.0	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Ann Arbor	E.	110.9	49	17 54	?PR ₁	—	—	47.7	—
La Paz		113.4	116	e 19 58	?PR ₁	34 10	?SR ₁	62.0	64.4
Toronto		114.1	47	19 12	[+38]	29 6	+63	58.9	80.6
Georgetown	E.	116.0	52	—	—	—	—	e 62.0	—
Ottawa		116.5	45	(e 19 31)	[+48]	30 23	?	e 47.8	—
Harvard		120.2	48	e 19 47	[+54]	e 31 27	?	59.8	—
Cape Town		124.7	208	58 15	?L	(33 30)	?	(58.2)	86.2
Dyce	N.	137.5	354	i 23 0	?PR ₁	—	—	—	77.0
Hamburg		138.8	343	e 19 54	[+16]	—	—	e 63.0	77.0
Edinburgh		138.9	354	e 23 0	?PR ₁	—	—	—	78.5
Helwan		140.5	299	22 0	?PR ₁	—	—	—	—
Stonyhurst		140.8	353	23 18	?PR ₁	—	—	—	83.0
Vienna		141.0	334	e 19 45	[+ 4]	—	—	e 53.0	78.2
De Bilt		141.4	344	e 19 38	[— 4]	e 32 56	?	e 67.0	74.0
Uccle		142.7	345	e 19 36	[— 8]	—	—	—	73.4
Oxford		142.8	352	23 25	?PR ₁	—	—	46.2	79.0
Kew		143.0	352	—	—	—	—	—	88.0
Strasbourg		143.9	340	19 42	[— 5]	—	—	—	80.4
Paris		145.0	346	e 22 25	?PR ₁	—	—	63.0	83.0
Padova		145.1	335	11 30	?	22 0	?PR ₁	—	—
Moncalieri		147.0	339	19 56	[+ 5]	36 13	?	56.3	90.8
Pompeii		147.4	327	20 52	[+60]	—	—	—	—
Rocca di Papa		147.6	329	e 19 42	[—10]	29 18	?	e 70.8	82.5
Barcelona		152.0	343	—	—	—	—	e 70.8	82.0
Tortosa		153.0	345	20 13	[+13]	33 54	?	53.0	82.7
Coimbra	N.	154.8	0	19 48	[—14]	e 27 46	?	43.8	89.1
Algiers		155.9	337	e 20 20	[+17]	—	—	37.0	82.0
Rio Tinto		157.2	356	28 0	?	—	—	—	108.0
Granada		157.4	350	20 25	[+20]	21 32	?	—	—
San Fernando		158.5	355	20 54	[+47]	—	—	—	91.0

Additional readings: Riverview gives also $i = +6m.14s.$ and $6m.37s.$, $PS = +11m.9s.$, $MN = +13.4m.$, $MZ = +13.5m.$, $T_0 = 18h.55m.36s.$ Christchurch gives L as PR_1 and records for $L = +26.0m.$ Melbourne $PR_1 = +8m.42s.$, $SR_1 = +14m.0s.$ Berkeley $e?E = +24m.17s.$, $eLV = +38.7m.$ Lick $eV = +38m.37s.$ Chicago $S = +35m.55s.$, $L = +48.0m.$ La Paz $iP? = +33m.33s.$ Toronto $i = +11m.12s.$, $e? = +31m.54s.$, $iL = +62.8m.$, $L = +72.2m.$ Georgetown $LE = +65.4m.$ Ottawa eP is given as PR_1 , $e = +36m.47s.$ Harvard $e = +38m.18s.$, $L = +62.0m.$, $+65.4m.$, and $+77.0m.$, $T_0 = 18h.55m.36s.$ Cape Town gives its reading $P = +33m.30s.$ from Milne-Shaw. Hamburg $eZ = +22m.14s.$ ($?PR_1$), $eNE = +23m.12s.$, $+45.0m.$, and $+46.0m.$ Helwan $PN = +23m.0s.$ Vienna $eZ = +22m.19s.$, $eE = +22m.30s.$ De Bilt $PR_1 = +22m.27s.$, $MN = +77.5m.$ Uccle $PR_1 = +22m.41s.$, $MN = +79.0m.$ Strasbourg $PR_1 = +22m.40s.$, $MN = +76.9m.$ Moncalieri $MN = -88.8m.$ Rocca di Papa $P = +20m.0s.$, $PR_1E = +23m.18s.$, $PR_1N = +23m.24s.$, $SN = +26m.54s.$ Coimbra $ePE = +20m.24s.$, $eS = +30m.18s.$, $ME = +91.3m.$ Granada readings have been increased by 1h. San Fernando $MN = +93.0m.$

Sept. 9d. Readings also at 0h. (La Paz), 1h. (Taihoku), 4h. (near Rocca di Papa), 6h. (near Tokyo), 8h. (La Paz), 9h. (Florence (2), Strasbourg, and near Rocca di Papa), 15h. (near Tokyo), 16h. (near Lick and Berkeley), 17h. (near Pompeii and Rocca di Papa), 21h. (Mizusawa), 22h. (Apia and Manila).

Sept. 10d. 22h. 3m. 0s. Epicentre $12^\circ 6S.$ $150^\circ 0E.$ (as on 1918 July 31d.).

$$A = -.845, B = +.488, C = -.218; \quad D = +.500, E = +.866; \\ G = +.189, H = -.109, K = -.976.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	21.3	177	e 4 58	+ 1	e 8 49	- 1	e 12.0	12.9
Honolulu	61.3	57	e 18 36	?S	(18 36)	- 4	23.0	29.0
Helwan	121.0	298	87 0	?L	—	—	(87.0)	—
Chicago	122.4	48	—	—	—	—	e 53.7	—
De Bilt	131.5	331	—	—	—	—	e 66.0	73.0
Uccle	132.7	331	—	—	—	—	e 65.0	—
San Fernando	148.0	322	82 0	?L	—	—	(82.0)	—

Additional readings: Riverview gives $PS = +9m.15s.$, $MN = +18.0m.$, $T_0 = 22h.3m.9s.$ Helwan $PN = +91m.0s.$ De Bilt $MN = +85.2m.$

Sept. 10d. Readings also at 2h. (Moncalieri) and near Rocca di Papa and Padova), 3h. (Florence), 4h. (near Padova (2)), 7h. (Vienna and near Pompeii, Rocca di Papa (2), Padova, Florence, and Mizusawa), 8h. (La Paz (2) and Rio Tinto), 9h. (Rocca di Papa), 14h. (near Tacubaya), 15h. (Taihoku and near Batavia), 16h. (Moncalieri), 21h. (Taihoku), 22h. (near Tokyo).

Sept. 11d. 2h. 19m. 40s. I }
3h. 50m. 25s. II } Epicentre $43^{\circ}\cdot8\text{N}$. $11^{\circ}\cdot2\text{E}$. (as on 1920 Sept. 8d.).
14h. 32m. 45s. III }

A = +.708, B = +.140, C = +.692; D = +.194, E = -.981;

G = +.679, H = +.134, K = -.722.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Florence	0.0	—	0 0	0	—	—	—	0.6
II	0.0	—	0 25	+25	—	—	—	0.7
III	0.0	—	0 10	+10	—	—	—	0.4
I Rocca di Papa	2.3	152	e 0 56	+20	—	—	(e 1.2)	2.3
II	2.3	152	e 0 47	+11	—	—	—	2.6
III	2.3	152	e 0 48	+12	—	—	—	2.0
I Moncalieri	2.8	295	e 0 55	+11	—	—	—	—
II	2.8	295	e 0 41	- 3	1 15	- 2	—	—
III	2.8	295	0 46	+ 2	1 19	+ 2	—	—
II Pompeii	3.9	142	2 36	?L	—	—	(2.6)	—
I Zurich	4.0	332	e 1 2	0	i 1 33	-17	—	—
II	4.0	332	e 1 3	+ 1	i 1 48	- 2	i 2.0	2.1
III	4.0	332	e 0 38	-24	i 1 35	-15	—	—
I Strasbourg	5.3	334	e 1 58	+36	—	—	—	—
II	5.3	334	e 1 22	0	e 2 13	-12	e 2.6	—
III	5.3	334	—	—	—	—	e 2.1	—
II Vienna	5.7	37	e 1 59	+31	—	—	—	3.9
III	5.7	37	e 2 31	?S	(e 2 31)	- 5	—	3.8
II Uccle	8.4	329	e 3 47	?S	(e 3 47)	0	—	—
II De Bilt	9.2	336	—	—	—	—	e 5.1	5.5
II Hamburg	9.8	356	e 1 35	-52	—	—	—	6.6
III	9.8	356	e 3 15	+48	—	—	—	6.2

Additional Readings: Rocca di Papa I PR₁E = +1m.32s. Rocca di Papa
III iPE = +0m.51s. Zurich I eN = +1m.1s., eV = +1m.8s. Zurich II
iE = +1m.46s. Zurich III ePE? = +0m.17s., iN = +1m.36s.

Sept. 11d. Readings also at 0h. (Florence), 2h. (Moncalieri), 4h. (Algiers), 5h. (Florence), 6h. (near Rocca di Papa and Padova), 7h. (near Florence), 8h. (Moncalieri (2)), 14h. (La Paz (2) and near Zurich), 17h. (Batavia), 20h. (San Fernando), 23h. (near Tacubaya).

Sept. 12d. 16h. 31m. 24s. Epicentre $43^{\circ}\cdot8\text{N}$. $11^{\circ}\cdot2\text{E}$. (as on Sept. 11d.).

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 22	+22	—	—	—	0.6
Padova	1.7	17	0 36	+10	0 58	+10	—	—
Rocca di Papa	2.3	152	e 0 52	+16	—	—	—	2.0
Moncalieri	2.8	295	e 0 47	+ 3	1 11	- 6	—	—
Pompeii	3.9	142	2 29	?L	—	—	(2.5)	—
Zurich E.	4.0	332	1 6	+ 4	i 1 39	-11	—	—
N.	4.0	332	1 1	- 1	i 1 40	-10	—	—
Strasbourg	5.3	334	e 1 8	-14	c 2 6	-19	—	—
Vienna	5.7	337	2 2	+34	—	—	—	3.7
Uccle	8.4	329	—	—	—	—	e 4.3	—
De Bilt	9.2	336	—	—	—	—	e 4.8	5.7
Hamburg	9.8	356	e 3 36	+69	—	—	—	5.6

Additional readings: Florence P = +0m.33s. Padova readings are given
1m. early. Rocca di Papa ePN = +0m.55s. Zurich eV = +1m.3s.
De Bilt MN = +6.5m.

Sept. 12d. Readings also at 1h. (near Florence, Padova, and Rocca di Papa), 8h. (Batavia), 9h. (Berkeley), 11h. (near Tacubaya and Oaxaca), 12h. (La Paz), 14h. (near Padova), 15h. (Batavia), 17h. (La Paz and near Athens), 18h. (Helwan, Moncalieri (2), and near Oaxaca), 19h. (Taihoku and near Tacubaya), 20h. (San Fernando), 22h. (La Paz), 23h. (La Paz and Uccle).

Sept. 13d. Readings at 0h. (Uccle and Helwan), 8h. (La Paz), 12h. (near Batavia), 13h. (Helwan and near Batavia), 15h. (Batavia), 17h. and 19h. (La Paz), 23h. (Florence).

Sept. 14d. 2h. 8m. 45s. Epicentre $41^{\circ}0'N$, $21^{\circ}5'E$.

$$A = +.702, B = +.277, C = -.656; \quad D = -.366, E = -.930; \\ G = -.610, H = +.240, K = -.755.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3.3	159	0 51	- 1	1 31	0	1.6	2.0
Pompeii	5.3	270	1 23	+ 1	—	—	—	—
Rocca di Papa	6.7	280	1 43	- 1	—	—	e 8.2	4.2
Vienna	8.1	335	2 4	+ 1	4 11	+31	i 4.7	6.0
Padova	8.3	306	2 1	- 5	3 36	- 9	—	—
Lemberg	9.0	10	—	—	e 4 3	0	—	5.6
Moncalieri	10.8	296	e 3 6	+25	4 42	- 8	6.7	9.5
Zurich	11.2	309	e 2 49	+ 2	—	—	—	—
Strasbourg	12.3	312	e 3 49	+46	5 36	+10	e 7.0	7.4
Besançon	12.7	305	5 6	?s	(5 6)	-31	(7.1)	—
Helwan	13.7	141	6 15	?s	(6 15)	+14	(7.2)	—
Hamburg	14.8	332	e 3 31	- 5	(e 6 26)	- 1	e 6.4	10.2
Uccle	15.4	316	—	—	e 6 36	- 5	e 8.6	—
Paris	15.6	307	—	—	e 6 49	+ 3	—	10.2
De Bilt	15.8	320	—	—	6 56	+ 6	8.6	10.7
Kew	18.2	312	—	—	—	—	—	14.2
Oxford	19.0	312	—	—	i 7 59	- 3	10.9	12.8
Eskdalemuir	21.7	320	8 57	?s	(8 57)	- 2	14.2	—
Edinburgh	21.9	321	—	—	—	—	12.2	15.4

Additional readings and notes: Athens gives $MN = +2.2m.$, $T_0 = 2h.8m.45s.$
 Rocca di Papa iPN = +1m.47s. Padova readings 1m. early. Moncalieri
 $MN = +8.8m.$ Hamburg $MN = +10.0m.$, $MZ = +10.4m.$ De Bilt
 $MN = +10.6m.$ Oxford iSR₁ = +10m.13s.

Sept. 14d. Readings also at 1h. (Taihoku), 4h. (near Tacubaya), 5h. (Moncalieri), 7h. (San Fernando), 13h. (La Paz), 18h. (Rio Tinto and La Paz), 19h. (Taihoku), 20h. (near Florence and Rocca di Papa), 22h. (San Fernando), 23h. (Manila (2), Batavia, and La Paz).

Sept. 15d. Readings at 1h. and 6h. (Helwan), 7h. (Apia and Batavia), 8h. (Kobe), 11h. (Lick), 12h. (La Paz), 14h. (near Rocca di Papa and Pompeii), 16h. (Apia), 20h. (Helwan), 22h. (Florence and San Fernando).

Sept. 16d. 4h. 17m. 0s. Epicentre $43^{\circ}8'N$, $11^{\circ}2'E$. (as on Sept. 12d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 10	+10	—	—	—	0.5
Padova	1.7	17	0 46	+20	1 7	+19	—	—
Rocca di Papa	2.3	152	e 0 36	0	(i 0 54)	- 9	—	2.3
Moncalieri	2.8	295	0 51	+ 7	1 24	+ 7	—	—
Pompeii	3.9	142	2 40	?L	—	—	(2.7)	—
Zurich	4.0	332	e 1 4	+ 2	i 1 43	- 7	—	2.3
E.	4.0	332	e 1 9	+ 7	i 1 45	- 5	—	2.1
N.	4.0	332	e 1 2	0	i 1 44	- 6	—	—
V.	5.0	316	2 1	?s	(2 1)	-16	—	—
Besançon	5.3	334	e 1 9	-13	—	—	—	—
Strasbourg	5.7	37	e 1 58	+30	—	—	i 2.9	3.8
Vienna	8.4	329	—	—	e 3 48	+ 1	e 4.6	—
Uccle	9.2	336	—	—	—	—	e 5.0	—
De Bilt	9.8	356	—	—	—	—	e 4.8	5.8
Hamburg	—	—	—	—	—	—	—	—

Zurich gives iPN = +1m.28s.

Padova readings given 1m. early.

Sept. 16d. 15h. 8m. 0s. Epicentre $42^{\circ}3'N$. $140^{\circ}0'E$. (as on 1915 Mar. 17d.).

A = -567, B = +475, C = +673; D = +643, E = -766;

G = -516, H = +133, K = -710.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	3.3	166	0 51	- 1	1 22	- 9	—	—
Ootomari	4.8	23	1 38	+24	2 3	- 8	2.6	3.6
Tokyo	6.6	182	1 36	- 5	2 35	-25	3.3	3.5
Nagoya	7.5	199	1 57	+ 3	—	—	—	—
Kobe	8.5	208	2 20	+11	—	—	4.1	4.4
Osaka	9.2	204	2 23	+ 4	(4 6)	- 2	4.1	5.7
Zi-ka-wei	18.9	237	c 1 12	-16	e 7 42	-18	—	—
Manila	32.9	215	c 7 22	-26	—	—	—	—
Hamburg	75.0	333	c 11 59	+10	c 21 42	+16	41.0	—
Eskdalemuir	76.6	339	—	—	—	—	36.0	—
Vienna	76.7	327	i 12 11	+12	—	—	—	50.5
De Bilt	77.8	334	—	—	—	—	c 38.0	46.6
Uccle	79.2	334	—	—	—	—	c 40.0	42.0
Strasbourg	79.9	330	—	—	—	—	e 45.0	—
Paris	81.5	334	—	—	—	—	e 44.0	53.0
Helwan	82.0	304	55 0	?L	—	—	(55.0)	—
Pompeii	82.8	322	12 40	+ 5	—	—	—	—
Moncalieri	82.9	328	—	—	c 23 5	+ 9	46.2	—
Rocca di Papa	83.5	323	i 12 44	+ 5	i 16 3	?PR ₁	—	—
N. Moncalieri	83.5	323	i 12 44	+ 5	c 16 30	?PR ₁	e 40.3	55.3
Rio Tinto	93.5	334	60 0	?	—	—	—	68.0
La Paz	144.2	51	i 19 52	[+ 5]	—	—	—	—

Additional readings: Mizusawa gives SN = +1m.24s. Kobe MN = +4.5m.

Osaka MN = +5.8m. De Bilt MN = +42.0m. Helwan PN = +52m.0s.

Moncalieri S? = +34m.33s.

Sept. 16d. 18h. 28m. 50s. Epicentre $43^{\circ}8'N$. $11^{\circ}2'E$. (as at 4h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	2.3	152	e 0 58	+22	(i 1 2)	- 1	—	2.7
Moncalieri	2.8	295	0 42	- 2	1 14	- 3	—	—
Pompeii	3.9	142	2 20	?L	—	—	(2.3)	—
Zurich	4.0	332	e 1 7	+ 5	1 54	+ 4	—	2.2
N. B. Zurich	4.0	332	e 1 7	+ 5	1 56	+ 6	—	2.2
Strasbourg	5.3	334	e 1 37	+15	—	—	—	—
Vienna	5.7	37	c 1 54	+26	—	—	—	3.5

Additional readings: Rocca di Papa gives its readings as ePN and iPE.

Zurich ePV = +1m.9s., iN = +1m.41s., iE = +1m.42s.

Sept. 16d. Readings also at 8h. (Moncalieri), 9h. (La Paz, Manila, Algiers, De Bilt, and Helwan), 11h. (La Paz (2), Manila, and Mizusawa), 12h. (Apia), 15h. (Lick), 22h. (Florence), 23h. (San Fernando).

Sept. 17d. 23h. 50m. 36s. Epicentre $32^{\circ}5'N$. $42^{\circ}0'W$.

A = +627, B = -564, C = +537; D = -669, E = -743;

G = +399, H = -360, K = -843.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Azores	14.3	64	5 0	+90	—	—	—	—
Harvard	25.0	301	—	—	10 29	+26	e 12.7	—
Coimbra	27.9	64	—	—	e 10 54	- 3	12.6	—
Ottawa	29.0	306	—	—	e 11 34	+17	e 15.0	—
Rio Tinto	29.2	70	18 54	?L	—	—	(18.9)	21.9
San Fernando	29.6	72	12 24	?S	(12 24)	+57	—	19.4
Toronto	31.2	304	—	—	i 11 0	-54	e 17.1	21.2
Tortosa	34.4	63	—	—	—	—	15.4	16.6
Eskdalemuir	35.3	39	13 2	?S	(13 2)	+ 2	—	—
Edinburgh	35.6	39	—	—	—	—	18.4	—
Chicago	37.1	298	7 31	0	13 24	- 1	18.4	—

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Ucele	38.8	48	—	—	e 13 41	- 1	e 16.7	20.4
De Bilt	39.1	46	—	—	e 13 58	+ 5	e 19.4	20.8
Moncalieri	40.0	58	—	—	(14 7)	0	14.1	—
Rocca di Papa N.	43.8	61	e 8 24	0	14 48	-11	e 16.8	—
Pompeii	45.3	62	8 24	-11	15 24	+ 5	—	—
Vienna	45.9	50	e 8 24	-15	—	—	—	—
La Paz	55.0	211	i 9 40	+ 1	—	—	—	—
Victoria	61.0	312	—	—	—	—	—	36.6
Helwan	61.5	71	35 24	?L	—	—	(35.4)	—

Additional readings: Harvard L = +13.2m. Paris ($\Delta = 36^{\circ}.8$) gives
 0h.1m.3s. De Bilt gives MN = +21.3m. Moncalieri gives its reading
 e = 23h.41m.14s., S? = 23h.53m.19s. Rocca di Papa ePE = +7m.54s.,
 also another ePN = +9m.42s., and SN = +15m.6s. Pompeii gives its
 readings 1h. late. Helwan PE = +38m.24s.

Sept. 17d. Readings also at 0h. (Lick, Sapporo, and Manila), 1h. (Rocca di Papa), 2h. and 8h. (La Paz), 10h. (near Hokoto and Taihoku), 14h. (La Paz and Helwan), 15h. (La Paz), 18h. (Riverview), 19h. (La Paz).

Sept. 18d. Readings at 0h. (near La Paz), 2h. (near Tacubaya), 4h. (La Paz), 5h. (near Tacubaya), 12h. (near La Paz), 13h. (Apia), 19h. (San Fernando), 21h. (La Paz).

Sept. 19d. Readings at 2h. (La Paz), 3h. (near Tokyo), 6h. (Manila), 9h. (La Paz), 16h. (near Oaxaca and Tacubaya), 19h. (La Paz).

1920. Sept. 20d. 14h. 38m. 50s. Epicentre $20^{\circ}.6S$. $168^{\circ}.8E$.

A = - .918, B = + .182, C = - .352; D = + .194, E = + .981;
 G = + .345, H = - .068, K = - .936.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	19.7	73	i 4 40	+ 3	8 26	+ 9	10.2	—
Riverview	20.5	226	i 4 52	+ 5	i 8 42	+ 8	e 9.6	10.8
Sydney	20.5	226	4 52	+ 5	8 46	+12	9.9	11.2
Christchurch	23.2	173	5 46	+27	—	—	9.9	17.2
Melbourne	26.8	225	5 34	-22	10 16	-21	—	—
Adelaide	30.1	235	i 6 19	-10	i 11 10	-26	i 15.0	16.1
Honolulu	53.0	40	i 9 46	+20	i 17 28	+32	—	31.3
Manila	58.7	304	e 10 7	+ 4	18 37	+30	30.0	30.3
Batavia	61.6	275	i 10 28	+ 5	i 18 43	0	25.0	34.4
Tokyo	62.6	335	10 29	0	19 33	+37	31.0	32.2
Nagoya	63.4	331	10 32	- 2	—	—	—	—
Osaka	63.7	331	10 35	- 1	19 9	0	27.1	32.4
Kobe	63.9	330	10 53	+16	19 29	+17	27.5	34.6
Taihoku	64.7	315	10 49	+ 6	(19 19)	- 2	19.3	34.8
Nagasaki	65.0	326	9 10	-95	—	—	—	—
Mizusawa	E. 65.1	337	10 46	0	19 21	- 5	—	—
	N. 65.1	337	10 47	+ 1	19 19	- 7	—	—
Zi-ka-wei	68.9	320	10 27	-43	e 20 6	- 7	—	37.3
Ootomari	71.2	343	11 25	+ 1	20 45	+ 5	32.8	35.7
Berkeley	E. 87.1	48	e 12 55	- 5	e 23 22	-20	e 39.8	44.9
	N. 87.1	48	e 12 59	- 1	e 23 21	-21	e 39.9	46.7
	Z. 87.1	48	e 12 57	- 3	—	—	—	46.1
Lick	E. 87.4	49	e 13 0	- 1	e 23 24	-21	e 40.4	44.6
	N. 87.4	49	e 12 58	- 3	e 23 23	-22	e 40.4	49.0
Calcutta	E. 89.5	294	12 58	-15	23 46	-23	34.6	52.1
	N. 89.5	294	13 10	- 3	23 58	-11	—	—
Colombo	91.4	277	14 10	+47	25 10	+42	65.2?	80.2
Victoria, B.C.	91.7	38	12 36	-49	(23 26)	-66	23.4	45.1
	Z. 91.7	38	12 40	-45	(23 40)	-52	23.7	40.7
Tucson	E. 93.2	57	13 32	- 1	24 4	-43	42.2	53.4
	N. 93.2	57	—	—	21 0	-47	43.8	49.7
Kodaikanal	94.8	280	13 46	- 4	(19 52)	?PR,	19.9	62.5
Tacubaya	E. 98.6	71	14 26	- 23	24 31	- 71	36.1	47.3
	N. 98.6	71	14 30	27	24 33	-69	34.3	47.2

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		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Oaxaca		100.0	76	24 5	?S	(24 5)	-111	46.2	49.6
Denver	E.	100.3	51	e 23 10	?	33 10	?SR ₁	44.2	52.2
Dehra Dun		100.9	299	e 18 25	?PR ₁	—	—	—	—
Mauritius	E.	101.2	243	12 28	-108	—	—	—	55.8
	N.	101.2	243	18 28	?PR ₁	—	—	—	53.8
Simla		101.8	300	e 18 10	?PR ₁	28 4	+111	42.4	62.9
Bombay		102.2	286	17 14	?	—	—	—	58.1
Seychelles		110.5	258	19 10	?PR ₁	(28 55)	+82	28.9	68.2
La Paz		113.0	120	e 15 43	+32	i 25 44	-130	47.4	56.9
Chicago		113.5	51	14 58	-16	25 30	-148	43.8	62.9
Cape Town		118.6	209	20 16	?PR ₁	30 30	+111	—	78.7
		118.6	209	20 20	?PR ₁	29 30	+51	66.2	77.2
Toronto		119.7	50	18 52	?	i 29 40	+53	36.5	71.0
Washington		121.3	55	16 3	+14	26 0	-179	e 44.7	—
Georgetown	E.	121.3	55	e 19 5	[+ 9]	e 30 27	?	e 49.6	69.2
	N.	121.3	55	e 19 5	[+ 9]	e 30 27	?	e 50.5	—
	Z.	121.3	55	e 19 10	[+14]	30 40	?	e 49.6	65.6
Cheltenham	E.	121.4	55	14 15	-94	—	—	59.4	67.8
	N.	121.4	55	26 5	?S	(e 27 19)	?SR ₁	61.0	72.6
Ithaca		121.7	51	e 27 34	?S	(e 27 34)	-88	54.5	—
Ottawa		122.3	47	19 7	[+ 8]	29 50	+44	e 51.0	66.2
Northfield		124.5	48	22 10	?PR ₁	—	—	61.2	—
Harvard	E.	125.7	51	—	—	i 29 6	-25	e 57.0	70.2
	N.	125.7	51	—	—	—	—	e 54.9	71.9
Rio de Janeiro		126.5	142	e 21 25	?PR ₁	—	—	—	—
Porto Rico	E.	129.0	82	—	—	—	—	61.3	63.2
	N.	129.0	82	—	—	—	—	62.4	64.0
Lemberg		139.6	323	e 19 40	[+ 1]	e 32 52	?	e 66.4	83.2
Helwan	E.	140.7	291	19 34	[- 6]	—	—	—	98.2
	N.	140.7	291	19 52	[+12]	—	—	—	99.7
Dyce	E.	142.8	351	19 38	[- 7]	31 54	?	46.7	68.6
	N.	142.8	351	19 40	[- 5]	33 2	?	46.3	67.6
Hamburg	E.	143.3	339	e 19 39	[- 7]	e 22 52	?PR ₁	e 64.4	85.0
	N.	143.3	339	e 19 41	[- 5]	e 22 56	?PR ₁	e 68.3	84.4
Edinburgh		144.3	351	19 42	[- 5]	—	—	51.2	81.7
Vienna	E.	144.6	329	e 19 40	[- 8]	36 48	?	e 68.7	83.5
	N.	144.6	329	e 19 43	[- 5]	36 47	?	e 69.0	83.2
Eskdalemuir		144.8	351	19 45	[- 3]	30 52	?	51.2	—
Athens		145.2	309	19 45	[- 3]	35 40	?	e 63.7	73.0
Stonyhurst		146.1	350	i 19 58	[+ 8]	32 40	?	76.4	95.2
De Bilt	E.	146.1	340	19 50	[0]	e 42 10	?SR ₁	e 76.2	81.6
	N.	146.1	340	—	—	e 42 16	?SR ₁	70.2	84.2
Uccle		147.4	341	i 19 51	[- 1]	e 33 34	?	e 68.2	86.2
Oxford		147.9	349	i 19 56	[+ 3]	i 42 23	?SR ₁	71.2	95.4
Kew		148.0	348	17 10	?	—	—	—	103.2
Strasbourg		148.2	334	i 19 53	[0]	32 28	?	e 66.7	87.7
Zurich		148.8	334	e 19 54	[0]	—	—	—	—
Padova		148.8	329	20 3	[+ 9]	—	—	—	86.8
Paris		149.7	342	i 19 56	[+ 1]	e 42 11	?SR ₁	63.2	88.2
Milan		150.0	330	20 4	[+ 8]	—	—	73.2	81.8
Besançon		150.0	336	19 57	[+ 1]	30 44	?	65.2	—
Florence		150.2	326	19 58	[+ 2]	—	—	—	20.3
Pompeii	E.	150.3	318	19 58	[+ 2]	28 28	?	46.2	84.2
Rocca di Papa		150.8	322	i 20 4	[+ 7]	e 21 10	?PR ₁	e 57.3	92.3
	N.	150.8	322	i 20 4	[+ 7]	—	—	e 71.3	93.3
Moncalieri		151.1	332	19 57	[0]	33 56	?	46.0	92.6
Barcelona		156.3	334	20 0	[- 4]	44 0	?SR ₁	e 66.2	88.2
Tortosa		157.5	337	20 10	[+ 4]	33 53	?	62.7	88.1
Algiers		159.8	326	20 11	[+ 3]	34 40	?	51.2	91.2
Coimbra		160.3	354	20 12	[+ 4]	36 54	?	e 64.9	92.4
Granada		162.2	340	20 15	[+ 6]	—	—	—	—
Rio Tinto		162.4	348	26 10	?PR ₁	—	—	—	108.2
San Fernando		163.6	346	20 31	[+20]	—	—	79.8	110.2

Additional readings: Riverview gives also $iP = +5m.8s.$, $iPR_2 = +6m.18s.$, $PS = +9m.6s.$, $MN = +13.7m.$, $MZ = +10.6m.$, $T_0 = 14h.38m.46s.$, Epicentre $18^\circ.5S$, $167^\circ.0E$. Adelaide $iPR_1 = +7m.4s.$, $iPR_2 = +7m.16s.$, $iPR_3 = +8m.10s.$, $i = +9m.10s.$, and $+10m.40s.$, $SR_3 = +13m.22s.$, $i = +14m.40s.$, Honolulu $PR_1 = +12m.34s.$, $SR_1 = +21m.58s.$, $T_0 = 14h.39m.0s.$, Manila $iE = +11m.19s.$, $iN = +13m.22s.$, $MN = +30.2m.$, $T_0 = 14h.38m.29s.$, Batavia $i = +13m.3s.$ ($?PR_1$), and $i + 22m.37s.$, $MN = +36.8m.$, $T_0 = 14h.39m.6s.$, Osaka $MN = +35.8s.$, $T_0 = 14h.39m.3s.$, Zi-ka-wei $PSN = +20m.31s.$, $PSE = +21m.0s.$, $SR_1E = +21m.20s.$, $SR_1N = +24m.42s.$, $SR_2N = +26m.51s.$, $SR_2E = +28m.13s.$, $MN = +34.9m.$

Notes continued on next page.

Ootomari MN = +36.1m. Debra Dun gives its reading for 21d. Victoria gives S as L and PR₁ as S = +16m.32s. For vertical instrument S = +16m.55s. Oaxaca S = +32m.47s., MN = +49.4m. Denver LN = +45.2m. Seychelles readings 1h. late. La Paz iP = +18m.51s., iS = -29m.28s., L = -53.1m., T₀ = 14h.45m.1s. Chicago PR₁ = +19m.40s. Cape Town—the Milne-Shaw readings are given first. Toronto i = +20m.28s. and +28m.4s., L = +61.5m. and 62.1m., eL = +77.1m. Georgetown iE = -27m.32s., LE = +59.2m., LN = +59.4m., LZ = +58.8m. Ithaca eS = +39m.30s., e = +42m.40s. Ottawa iE = +26m.5s., iE = -27m.37s., L = +61.2m., T₀ = 14h.45m.12s. Northfield eL = +53.2m. Harvard PR₁E = +20m.24s., PR₁N = +20m.56s., iE = +22m.6s., PR₂E = -26m.18s., iE = +32m.40s., iN = +32m.53s., SR₁E = +37m.7s., SR₁N = -37m.38s., eE = +40m.12s., SR₂E = +42m.52s., T₀ = 14h.38m.36s. Porto Rico ePR₁N = +22m.46s., iPR₁E = +22m.45s., ePR₂E = +26m.30s., iSR₁E = +39m.19s. Vienna iPZ = +19m.44s., iPN = +19m.47s., i = +35m.38s. Hamburg iPZ = +19m.37s. Athens iN = +20m.54s. and +21m.18s., PR₁N = +24m.12s., PR₁E = +24m.15s., PR₂E = +28m.44s., MN = +65.8m., T₀ = 14h.39m.5s. De Bilt e = +17m.30s., eE = +47m.14s., eN = +47m.38s. Paris MN = +89.2m. Strasbourg MN = +81.1m. Zurich iP = +19m.58s. Moncalieri MN = +90.5m. Barcelona three readings +24m.19s., +28m.0s., and +34m.31s. Algiers PR₁ = +24m.0s. Coimbra PR₁N = +24m.44s., PR₁E = +25m.34s., LN = +51.2m., MN = +95.7m. San Fernando MN = +97.7m.

Sept. 20d. 17h. 28m. 15s. Epicentre 20° 68. 168° 8E. (as at 14h.).

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	19.7	73	e 4 45	+ 8	—	—	10.0	—
Riverview	20.5	226	i 4 47	0	i 8 37	+ 3	—	11.7
Manila	58.7	304	e 9 45	-18	—	—	—	—
Batavia	61.6	275	e 10 7	-16	—	—	—	—
Osaka	63.7	331	10 2	-34	—	—	—	19.5
La Paz	113.0	120	20 9	?PR ₁	—	—	—	—
Vienna	144.6	329	i 19 29	[-19]	—	—	—	21.0
De Bilt	146.1	340	19 45	[-5]	—	—	—	—
Uccle	147.4	341	19 36	[-16]	—	—	—	—
Strasbourg	148.2	334	19 45	[-8]	—	—	—	—
Padova	148.8	329	19 45	[-9]	—	—	—	—
Paris	149.7	342	19 44	[-11]	—	—	86.8	89.8
Rocca di Papa	150.8	322	i 19 45	[-12]	—	—	—	20.0

Riverview gives also iP = +4m.35s., MZ = +9.8m., MN = +12.4m.

Sept. 20d. 20h. 25m. 57s. Epicentre 40° 0N. 144° 5E. (as on 1917 April 21d.).

A = -624, B = +445, C = +643; D = +581, E = +814;
G = -523, H = +373, K = -766.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa E.	2.8	252	0 44	0	1 16	- 1	—	—
N.	2.8	252	0 44	0	1 18	+ 1	—	—
Tokyo	5.7	222	1 29	+ 1	—	—	2.8	3.5
Ootomari	6.8	350	1 49	+ 5	—	—	—	—
Osaka	8.9	236	2 42	+27	—	—	4.5	5.4
Kobe	9.1	237	e 2 16	- 2	—	—	e 5.4	6.8
Zi-ka-wei	20.7	252	e 4 43	- 6	e 8 47	+ 9	—	—
Taihoku	24.3	239	—	—	e 8 7	?	—	—
Hamburg	78.6	335	—	—	—	—	e 42.0	48.0
Edinburgh	80.3	344	—	—	—	—	45.0	—
Vienna	80.6	328	12 7	-16	—	—	e 43.6	52.4
Eskdalemuir	80.8	344	—	—	—	—	46.0	—
De Bilt	81.4	337	—	—	e 22 42	+ 3	42.0	48.0
Strasbourg	83.6	332	—	—	—	—	e 44.0	—
Kew	83.6	340	—	—	—	—	—	53.0
Paris	85.1	338	—	—	—	—	e 46.0	54.0
Moncalieri	86.6	331	—	—	—	—	47.9	—
Tortosa	92.8	335	—	—	—	—	e 48.0	54.4

Additional readings: Osaka gives MN = 5.6m. Kobe LN = 4.1m., MN = -6.0m. Taihoku gives its single reading as at 21h. De Bilt MN = +52.5m.

Sept. 20d. 23h. 35m. 8s. Epicentre $45^{\circ}5'N$, $94^{\circ}0'E$.

$A = -.049$, $B = +.699$, $C = +.713$; $D = +.998$, $E = +.070$;
 $G = -.050$, $H = +.711$, $K = -.701$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Simla	19.4	228	e 3 58	-36	—	—	—	7.9
Dehra Dun	19.6	225	4 52	+16	—	—	—	—
Calcutta	E. 23.4	193	5 16	-5	9 40	+7	15.3	—
	N. 23.4	193	5 28	+7	9 34	+1	14.9	—
Zi-ka-wei	25.6	114	—	—	—	—	e 14.3	—
Sapporo	33.5	76	15 29	?L	19 47	?	24.6	—
Kodaikanal	38.1	209	17 28	?L	—	—	(17.5)	—
Colombo	40.5	201	21 52	?L	—	—	(21.9)	—
Lemberg	45.6	301	—	—	—	—	e 21.9	26.0
Helwan	50.6	274	17 52	?S	(17 52)	+86	—	—
Vienna	50.8	305	e 9 19	+7	—	—	e 24.4	29.5
Hamburg	51.9	311	—	—	—	—	e 28.9	31.0
De Bilt	55.2	311	—	—	e 17 17	-7	e 28.9	32.8
Strasbourg	55.6	308	e 27 48	?L	—	—	(e 27.8)	30.9
Rocca di Papa	56.4	298	—	—	e 21 34	?SR ₁	—	—
Edinburgh	57.2	319	—	—	—	—	30.9	36.4
Eskdalemuir	57.6	319	—	—	—	—	27.9	—
Moncalieri	57.6	304	e 21 11	?SR ₁	26 43	?L	31.6	33.6
Kew	58.3	314	—	—	—	—	—	34.9
Paris	58.3	310	—	—	e 21 52	?	—	33.9
Oxford	58.7	314	—	—	—	—	29.8	35.7
Tortosa	64.3	305	—	—	—	—	e 34.9	38.1
Coimbra	69.8	307	e 13 35	+139	23 15	+171	e 40.2	—

Additional readings: Helwan gives also PN = +13m.52s. (?PR₁N). Ham-
 burg e = +22m.52s., eN = +26m.31s. De Bilt eSR₁ = +21m.0s., MN =
 +32.8m.

Sept. 20d. Readings also at 5h. (San Fernando), 7h. (Kew), 13h. (Apia), 15h. (Florence), 16h. (Mauritius), 18h. (Manila), 23h. (Helwan).

Sept. 21d. 2h. 34m. 18s. Epicentre $18^{\circ}0'S$, $167^{\circ}0'E$. (as on 1920 Feb. 27d.).

$A = -.927$, $B = +.214$, $C = -.309$; $D = +.225$, $E = +.974$;
 $G = +.301$, $H = -.070$, $K = -.951$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	21.3	219	e 4 36	-21	i 8 57	+7	e 10.2	10.6
Sydney	21.3	219	4 54	-3	8 42	-8	10.3	11.3
Christchurch	26.0	171	5 48	0	9 54	-28	13.3	15.9
Melbourne	27.7	220	—	—	11 24	+30	14.7	16.2
Adelaide	30.4	231	i 5 0	-92	—	—	—	16.2
Honolulu	52.2	43	17 6	?S	(17 6)	+20	24.3	34.9
Manila	55.9	303	e 9 53	+8	—	—	—	—
Batavia	59.8	273	e 10 5	-6	i 18 39	+18	—	—
Kodaikanal	92.8	280	57 12	?	—	—	—	—
Chicago	113.2	50	29 12	?S	(29 12)	+76	e 58.7	—
La Paz	115.7	119	e 16 13	+49	29 13	+57	61.7	67.6
Toronto	119.3	49	—	—	—	—	e 64.6	72.1
Ottawa	121.7	48	—	—	—	—	e 60.7	—
Harvard	125.4	50	e 77 59	?	—	—	81.3	—
Helwan	138.0	295	39 42	?	—	—	—	—
Vienna	141.5	328	19 29	[-13]	—	—	—	21.4
De Bilt	143.1	342	—	—	—	—	e 82.7	85.1
Oxford	145.0	347	e 20 2	[+14]	—	—	—	—
Strasbourg	145.1	336	e 19 42	[-6]	—	—	—	—
Paris	146.7	341	e 19 42	[-9]	—	—	78.7	—
Rocca di Papa	147.7	323	i 19 57	[+5]	—	—	—	21.7

Additional readings: Riverview gives iP = +4m.42s. and +5m.54s., MZ =
 +11.0m., MN = +11.2m. Epicentre $17^{\circ}0'S$, $169^{\circ}0'E$, $T_0 = 2h.33m.26s$.
 Christchurch SR₁ = +11m.18s. Chicago S = +40m.5s. La Paz P? =
 +19m.42s. (?PR₁). Helwan PN = +40m.42s. De Bilt MN = +85.4m.
 Rocca di Papa iPN = +20m.4s.

Sept. 21d. 17h. 42m. 6s. Epicentre 45°·3N. 153°·5E.

A = -·630, B = +·314, C = +·711; D = +·446, E = +·895;
G = -·636, H = +·317, K = -·703.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari		7·6	284	2 6	+11	—	—	4·3	6·2
Mizusawa	E.	11·0	240	2 37	- 7	4 26	-28	—	—
	N.	11·0	240	2 38	- 6	4 29	-25	—	—
Tokyo		14·2	232	3 19	-10	5 29	-44	9·4	11·2
Nagoya		16·1	237	3 46	- 7	—	—	—	—
Osaka		17·4	239	4 9	- 1	7 24	- 3	7·4	11·5
Kobe		17·6	239	4 5	- 7	7 27	- 4	10·2	12·5
Zi-ka-wei		28·6	252	6 0	-14	e 10 47	-23	—	18·4
Taihoku		32·7	242	e 7 44	?SR ₁	—	—	—	—
Manila		41·2	233	e 7 48	-17	—	—	—	—
Honolulu		46·1	103	14 48	?S	(14 48)	-41	e 21·9	31·2
Batavia		66·2	233	i 10 52	- 1	i 19 40	0	—	—
Colombo		73·6	265	44 54	?L	—	—	(44·9)	56·9
Lemberg		75·3	330	e 12 0	+ 9	—	—	e 45·5	50·3
Hamburg		76·4	339	i 12 0	+ 3	e 21 48	+ 6	e 42·4	46·0
Edinburgh		77·0	348	—	—	i 22 0	+11	—	49·4
Chicago		77·3	42	11 17	-46	21 54	+ 2	e 42·4	—
Eskdalemuir		77·5	348	12 1	- 3	21 57	+ 2	39·4	—
Ann Arbor		78·7	39	22 0	?S	(22 0)	- 8	—	—
Stonyhurst		78·8	346	18 30	?PR ₁	—	—	—	50·4
De Bilt		78·9	340	12 17	+ 5	22 15	+ 4	e 38·9	55·8
Riverview		79·2	182	e 12 12	- 2	(e 22 18)	+ 4	e 22·3	55·0
Vienna		79·3	333	12 15	0	e 22 19	+ 4	39·9	54·4
Ottawa		79·5	32	—	—	e 22 18	0	e 36·9	—
Ucele		80·3	341	12 19	- 2	22 27	0	e 38·9	56·9
Kew		80·6	345	—	—	—	—	—	56·9
Oxford		80·6	346	e 12 30	+ 7	i 22 40	+10	—	54·9
Strasbourg		81·6	338	i 12 26	- 2	22 40	- 2	e 41·9	51·5
Paris		82·6	342	i 12 33	- 1	e 22 53	0	43·9	57·9
Besançon		83·2	339	12 35	- 2	23 5	+ 6	49·9	—
Melbourne		83·5	187	—	—	—	—	e 32·9	52·9
Harvard		83·7	31	—	—	—	—	e 45·2	—
Georgetown		84·3	31	—	—	e 23 8	- 3	—	—
Washington		84·3	37	12 42	- 2	23 10	- 1	62·4	—
Moncalieri		84·8	337	12 39	- 8	23 9	- 8	46·1	52·6
Rocca di Papa	E.	86·3	332	12 51	- 4	—	—	—	—
	N.	86·3	332	12 54	- 1	e 20 12	? e 48·0	59·5	—
Pompeii		86·4	330	12 14	-41	—	—	—	—
Helwan		88·4	314	13 54	+47	—	—	—	—
Barcelona		89·6	339	—	—	e 23 47	-23	—	24·3
Tortosa		90·6	341	—	—	—	—	e 35·9	62·2
Coimbra	E.	93·1	347	e 12 40	-53	e 23 16	-90	e 49·3	—
	N.	93·1	347	e 13 16	-17	23 8	-98	e 48·3	—
Algiers		93·8	337	—	—	—	—	55·9	60·9
San Fernando		96·3	345	27 24	?S	(27 24)	+125	—	60·9
La Paz		134·9	62	i 19 32	[+ 2]	—	—	75·9	82·4

Additional readings: Tokyo gives MN = +11·2m. Osaka MN = +8·5m.
 Kobe 6min. has been added to P, MN = +12·3m. Zi-ka-wei MN =
 +17·2m., T₀ = 17h.42m.5s. Honolulu eS = +18m.54s. (?SR₁). Ham-
 burg MN = +53·8m., MZ = +55·0m. Chicago L = +45·4m. Eskdale-
 muir PR₁ = +15m.5s., SR₁ = +27m.4s., T₀ = 17h.42m.10s. Ann Arbor
 PN = +21m.48s. De Bilt PR₁N = +15m.14s., eE = +22m.23s., SR₁ =
 +27m.53s., MN = +56·1m., T₀ = 17h.42m.23s. Riverview gives eI =
 -0m.36s. and -7m.30s., eL 23·0m., MN = +27·8m. Vienna iPZ =
 +12m.13s. Ucele SR₁ = +28m.6s., MN = +45·6m., T₀ = 17h.42m.15s.
 Paris iS = +22m.58s., MN = +44·9m. Harvard L = +52·0m. and
 +55·7m., T₀ = 17h.42m.46s. Georgetown eE = +22m.54s. Rocca di
 Papa iPN = +12m.38s. Helwan PE = +14m.54s. Coimbra eLN =
 -33·7m., T₀ = 17h.42m.16s. San Fernando MN = +68·4m. La Paz i =
 +23m.5s. (?PR₁).

Sept. 21d. Readings also at 0h. (near La Paz), 1h. (Apia), 5h. (Chicago, Manila,
 Honolulu, and near Sapporo), 6h. (De Bilt), 7h. (near Tokyo), 13h. (La
 Paz), 14h. (Helwan), 15h. (Rio Tinto), 16h. (Riverview, Melbourne, and
 Stonyhurst), 17h. (Stonyhurst), 19h. (Cape Town), 23h. (Taihoku).

Sept. 22d. Readings also at 2h. (Sapporo), 11h. (near Oaxaca and Tacubaya),
 12h. (Helwan), 16h. (Taihoku and Moncalieri), 17h. (La Paz and near
 Tacubaya), 18h. (La Paz), 19h. and 23h. (San Fernando).

Sept. 23d. 5h. 32m. 35s. Epicentre $49^{\circ}0'N$. $156^{\circ}0'E$.

$$A = -.599, B = +.267, C = +.755; D = +.407, E = +.914; \\ G = -.689, H = +.307, K = -.656.$$

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Ootomari		9.2	260	2 27	+ 8	(4 13)	+ 5	4.2	5.2
Mizusawa	E.	14.5	233	3 32	- 1	6 2	-18	—	—
	N.	14.5	233	3 35	- 2	6 6	-14	—	—
Tokyo		17.9	228	4 11	- 5	5 55	?PR ₁	10.3	10.4
Nagoya		19.7	232	4 38	—	—	—	—	—
Osaka		20.8	234	5 9	18	(8 47)	+ 7	8.8	9.0
Kobe		21.0	235	4 52	- 1	(8 27)	-17	8.4	9.2
Zi-ka-wei		31.5	249	e 6 37	- 6	c 11 31	-29	—	—
Taihoku		35.9	240	—	—	—	—	e 17.4	—
Manila		44.8	232	e 8 39	+ 7	(e 14 57)	-15	e 15.0	15.1
Honolulu		45.6	109	15 43	?S	(15 43)	+21	e 23.2	39.1
Batavia		69.8	233	11 17	+ 1	20 24	0	—	—
Hamburg		73.4	340	i 11 41	+ 3	—	—	e 36.4	46.9
Chicago		73.4	44	10 49	-49	21 7	0	38.7	—
Edinburgh		73.7	349	—	—	e 21 25	+15	—	52.4
Kodaikanal		74.8	270	46 25	?L	—	—	(46.4)	—
Stonyhurst		75.5	347	e 22 7	?S	(22 7)	+35	—	52.4
De Bilt		75.9	341	11 57	+ 3	21 40	+ 4	e 38.4	45.8
Vienna		76.7	334	e 11 59	0	e 21 43	- 2	e 39.4	48.9
Uccle		77.3	341	12 2	- 1	21 48	- 4	e 38.4	47.4
Strasbourg		78.7	339	i 12 11	0	e 21 58	-10	e 39.4	53.4
Zurich		79.6	339	e 12 16	- 1	—	—	—	—
Paris		79.6	344	e 12 24	- 7	e 22 37	+18	45.4	48.4
Besançon		80.3	340	12 20	- 1	—	—	40.4	—
Moncalieri		82.0	339	12 31	+ 1	22 38	- 8	32.9	—
Riverview		83.0	183	—	—	—	—	e 41.3	42.5
Rocca di Papa		83.7	333	i 12 37	- 3	23 1	- 5	e 46.5	54.5
Pompeii		84.0	330	11 49	-53	—	—	—	—
Helwan		87.0	314	23 25	?S	(23 25)	-16	—	—
Algiers		90.9	339	—	—	—	—	50.4	54.4
La Paz		131.8	62	i 19 33	[+10]	22 56	?PR ₁	—	—

Additional readings: Osaka gives also MN = +9.1m. Honolulu S = +20m.13s. (?SR₁). De Bilt eSR₁N = +26m.45s., MN = +40.3m., T₀ = 5h.32m.48s. Vienna iP = +12m.1s. Uccle SR₁ = 27m.7s. Strasbourg MN = +45.8m., T₀ = 5h.32m.57s. Riverview e? = +26m.31s., e = +36m.37s., MN = +44.0m. Rocca di Papa gives S 10min. too early.

Sept. 23d. 19h. 37m. 0s. Epicentre $49^{\circ}0'N$. $156^{\circ}0'E$. (as at 5h.).

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mizusawa	E.	14.5	233	3 35	+ 2	—	—	—	—
	N.	14.5	233	3 38	+ 5	6 25	- 5	—	—
Tokyo		17.9	228	e 2 57	-79	—	—	—	—
Nagoya		19.7	232	2 27	-130	—	—	—	—
Osaka		20.8	234	(4 51)	0	—	—	4.8	6.2
Kobe		21.0	235	(4 38)	-15	—	—	4.6	5.2
Zi-ka-wei		31.5	249	6 36	- 7	e 8 44	?PR ₁	—	9.0
Taihoku		35.9	240	e 7 5	-16	—	—	8.6	—
Manila		44.8	232	(7 8)	-84	7 8	?P	8.8	9.1
Batavia		69.8	233	e 7 50	?	—	—	e 32.7	—
Hamburg		73.4	340	—	—	—	—	e 44.0	47.0
Edinburgh		73.7	349	—	—	—	—	45.0	54.5
De Bilt		75.9	341	—	—	e 23 8	-92	e 44.0	50.6
Vienna		76.7	334	—	—	—	—	e 45.0	55.0
Uccle		77.3	341	—	—	—	—	e 45.0	50.4
Strasbourg		78.7	339	e 30 6	?SR ₁	—	—	e 46.0	49.0
Paris		79.6	344	—	—	—	—	e 47.0	50.0
Moncalieri		82.0	339	—	—	e 23 31	+45	46.6	55.5
Rocca di Papa		83.7	333	—	—	—	—	e 48.0	49.5
Helwan		87.0	314	47 0	?L	—	—	(47.0)	—
Coimbra	E.	89.8	349	e 23 55	?S	(e 23 55)	-17	e 52.5	57.2
	N.	89.8	349	e 24 25	?S	(e 24 25)	+13	—	57.1
San Fernando		93.1	346	—	—	—	—	—	58.0
La Paz		131.8	62	20 18	[+55]	—	—	—	—

Additional readings: Osaka gives also PS = +2m.17s., MN = +6.8m. Kobe gives PS = +2m.4s. Zi-ka-wei readings have been increased by 5m., T₀ = 19h.35m.59s. Taihoku readings have been increased by 5m. Manila e = +4m.30s., MN = +9.6m., but this is probably another shock. Hamburg MZ = +53.0m. De Bilt MN = +50.7m. Helwan PN = +34m.0s. Coimbra S = +38m.0s. San Fernando MN = +59.5m.

Sept. 23d. Readings also at 1h. (Apia, La Paz, and Batavia), 5h. (Cape Town), 8h. (Moncalieri), 9h. (Rocca di Papa and Pompeii), 10h. (Moncalieri), 14h. (Sapporo), 15h. (Barcelona), 17h. (Batavia and near La Paz), 20h. (near Nagasaki), 23h. (San Fernando).

1920. Sept. 24d. 21h. 54m. 50s. Epicentre 6°0'N. 83°0'W.

A = +.121, B = -.987, C = +.104; D = -.993, E = -.122;

G = +.013, H = -.104, K = -.994.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°		m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	E.	4.5	49	0 57	-13	2 0	- 4	2.5	2.9
	N.	4.5	49	0 54	-16	1 56	- 8	2.7	3.8
Oaxaca	E.	17.5	311	4 23	+12	8 2	+33	8.8	9.5
	N.	17.5	311	4 23	+12	8 2	+33	8.8	9.4
	Z.	17.5	311	4 23	+12	8 10	+33	8.9	9.7
Tacubaya	E.	20.8	312	5 1	+10	9 9	+29	10.5	11.7
	N.	20.8	312	5 1	+10	9 14	+34	10.7	11.5
Porto Rico		21.1	53	4 56	- 2	4 55	+ 9	10.4	10.6
La Paz		26.8	147	4 56	0	10 38	+ 1	12.8	17.1
Georgetown	E.	33.4	11	6 53	- 7	12 14	-16	18.6	—
	N.	33.4	11	6 53	- 7	12 17	-13	15.3	—
Washington		33.4	11	6 50	-10	12 46	+16	18.2	—
Chicago		35.0	355	7 0	-22	13 5	- 5	18.2	—
Ithaca		36.9	10	7 20	- 9	13 4	-18	18.0	—
Tucson	E.	37.0	321	7 25	- 5	13 24	0	19.9	20.6
	N.	37.0	321	7 28	- 2	13 21	- 3	18.9	22.6
Harvard	E.	37.8	16	7 40	+ 4	13 14	-21	15.9	—
	N.	37.8	16	7 40	+ 4	13 20	-15	16.0	—
Toronto		37.8	7	—	—	13 52	+17	17.6	22.6
Ottawa		39.9	10	7 47	- 7	13 53	-12	16.4	—
Victoria		54.5	329	17 39	?S	(17 39)	+24	27.5	34.7
Honolulu		73.9	291	—	—	21 40	+27	34.3	42.0
Coimbra	E.	74.4	50	e 12 0	+15	21 31	+12	33.5	—
	N.	74.4	50	e 11 33	-12	21 31	+12	31.6	—
Rio Tinto		75.6	53	27 10	?SR ₁	—	—	—	55.2
San Fernando		75.9	55	21 10	?S	(21 10)	-26	—	—
Granada		77.9	54	i 12 18	+12	i 22 7	+ 8	—	—
Edinburgh		79.4	36	—	—	22 10	- 6	—	—
Oxford		80.2	40	—	—	22 30	+ 5	39.1	41.1
Tortosa		81.2	50	12 35	+ 9	22 47	+10	34.5	36.5
Barcelona		82.4	50	—	—	25 10	+140	—	—
Paris		82.6	42	e 12 33	- 1	i 22 54	+ 1	37.2	40.2
Uccle		83.7	40	e 12 41	+ 1	23 7	+ 1	35.2	42.2
De Bilt	E.	84.2	40	—	—	23 9	- 1	e 39.2	41.8
	N.	84.2	40	—	—	23 14	+ 4	e 39.2	40.2
Strasbourg		86.0	42	e 12 58	+ 5	e 23 31	+ 1	e 36.2	44.2
Hamburg		87.3	38	e 13 4	+ 3	e 23 28	-16	e 40.2	—
Rocca di Papa	E.	90.3	49	i 13 20	+ 2	i 25 22	+65	—	—
Vienna		91.8	41	e 13 23	- 3	—	—	—	—
Cape Town		102.8	125	50 41	?L	—	—	(50.7)	57.4
Helwan		107.7	58	27 10	?S	(27 10)	+ 3	—	—

Additional readings: Oaxaca readings have been diminished by 4m. Chicago SR₁ = +15m.34s., T₀ = 21h.54m.9s. Ithaca gives also LE = +16.0m., T₀ = 21h.54m.56s. Tucson PR₁E = +8m.52s., PR₁N = +9m.0s., T₀ = 21h.54m.46s. Harvard iE = +8m.45s., iN = +8m.55s., T₀ = 21h.54m.3s. Toronto eL = +20.8m. Ottawa PR₁ = +9m.17s., T₀ = 21h.54m.54s. Uccle SR₁ = +28m.40s., T₀ = 21h.55m.2s. De Bilt eSR₁ = +28m.53s. Rocca di Papa eE = +13m.10s., eN = +13m.16s., iPN = +13m.27s. Helwan PE = +25m.10s.

Sept. 24d. Readings also at 0h. (San Fernando), 1h. (Zi-ka-wei and Moncalieri), 3h. (Zi-ka-wei), 4h. (Batavia, Manila, Riverview, and La Paz), 5h. (Zi-ka-wei, Manila, Helwan, and Victoria), 6h. (Kodaikanal), 9h. (Athens), 11h. (Zi-ka-wei), 14h. (Athens, Zante, Pompeii, and near Rocca di Papa), 15h. (near La Paz), 17h. (Ann Arbor), 23h. (Colombo, Toronto, and near Tacubaya).

Sept. 25d. Readings at 0h., 1h., 2h. (2) (La Paz), 13h. (Algiers), 14h. (Rocca di Papa), 18h. (Algiers), 20h. (San Fernando).

Sept. 26d. Readings at 0h. (La Paz, Helwan, Zi-ka-wei, Calcutta, and near Pompeii and Rocca di Papa), 1h. (near Rocca di Papa), 2h. (near Pompeii and Rocca di Papa), 3h. (near Rocca di Papa), 6h. (Tortosa and near Tokyo), 8h. and 10h. (2) (near Rocca di Papa), 13h. (San Fernando), 19h. (near Rocca di Papa and Pompeii).

Sept. 27d. 5h. 25m. 45s. Epicentre $27^{\circ}0'N$. $109^{\circ}5'W$. (as on 1918 May 23d.).

$$A = -.297, B = -.840, C = +.454; \quad D = -.943, E = +.334; \\ G = -.152, H = -.428, K = -.891.$$

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mazatlan		4.8	143	—	—	—	—	2.4	3.4
Tucson	E.	5.4	348	e 1 53	+30	—	—	2.6	3.2
	N.	5.4	348	e 1 25	+ 2	—	—	2.7	3.8
Tacubaya		12.1	127	3 50	+50	—	—	8.0	8.8
Berkeley		15.3	318	—	—	(e 6 10)	-29	e 6.2	—
Chicago		23.2	45	5 34	+15	9 35	+ 6	11.9	14.0
Victoria		23.9	337	9 31	?8	(9 31)	-11	12.0	15.4
Ann Arbor		26.0	47	12 57	?L	—	—	(13.0)	—
Toronto		29.4	48	i 5 9	-73	—	—	e 16.4	19.8
Ithaca		30.9	49	—	—	e 16 27	?L	17.5	—
Ottawa		32.5	46	6 23	-30	12 23	+ 7	e 17.9	—
Northfield		34.1	50	—	—	—	—	e 18.2	—
Harvard	E.	34.7	54	—	—	—	—	18.9	20.3
	N.	34.7	54	—	—	e 12 56	+ 5	18.8	—
Edinburgh		76.4	34	—	—	—	—	44.2	—
Eskdalemuir		76.6	34	—	—	—	—	40.2	—
Stonyhurst		77.8	35	42 15	?	45 3	?	48.0	—
Oxford		79.4	39	—	—	—	—	e 46.4	—
Kew		80.1	37	—	—	—	—	—	48.2
De Bilt		82.5	35	—	—	e 24 33	+101	39.2	50.8
Uccle		82.8	36	—	—	—	—	e 34.2	—
Rio Tinto		83.0	51	50 15	?L	—	—	(50.2)	57.2
Paris		83.0	38	—	—	—	—	e 41.2	49.2
San Fernando		84.0	52	47 15	?L	—	—	(47.2)	55.2
Hamburg		84.0	31	—	—	—	—	e 48.2	—
Strasbourg		86.0	38	—	—	—	—	e 45.2	55.2
Vienna		90.5	33	—	—	—	—	e 44.2	61.8
Rocca di Papa		93.0	40	i 25 33	?8	(25 33)	+48	e 56.4	58.2

Additional readings: Mazatlan has been diminished by 1hr. Ann Arbor gives PN = +13m.3s., PE (Wiechert) = +12m.51s. Harvard eN? = +11m.30s., eE = +18m.19s., LE = +19.3m., eN = +19m.22s., LE = +20.3m. LN = +21.7m. De Bilt MN = +42.2m. San Fernando MN = +50.2m. Rocca di Papa eN = +25m.33s.

Sept. 27d. 5h. 29m. 36s. Epicentre $43^{\circ}7'N$. $144^{\circ}4'E$.

$$A = -.588, B = +.421, C = +.691.$$

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Ootomari		3.2	0 49	- 1	(1 20)	- 8	1.3	1.4
Mizusawa	E.	5.2	1 22	- 2	2 24	+ 2	—	—
	N.	5.2	1 22	+ 2	2 26	+ 4	—	—
Tokyo		8.8	2 23	+10	—	—	—	—
Zi-ka-wei		22.0	e 5 2	- 3	—	—	—	—

No additional readings.

Sept. 27d. Readings also at 3h. (Apia), 5h. 42m. (near Georgetown, Washington, Cheltenham, and Northfield), 7h. (Manila (2)), 8h. (Pompeii, Helwan, and near Rocca di Papa), 10h. (Riverview, Sydney, Melbourne, and near Mizusawa and Tokyo), 13h. (Batavia, Manila, and near Tokyo), 14h. (Helwan), 15h. (Mazatlan and Azores), 18h. (Apia), 21h. (San Fernando and near Mizusawa), 23h. (Helwan and Lick).

Sept. 28d. 15h. 17m. 20s. Epicentre $38^{\circ}0'N$. $29^{\circ}5'E$.

$A = +.686$, $B = +.388$, $C = +.616$; $D = +.492$, $E = -.870$;
 $G = +.536$, $H = +.303$, $K = -.788$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	4.5	271	i 1 10	0	—	—	1.6	2.2
Helwan	8.3	169	1 40	-26	(3 40)	-5	—	—
Pompeii	11.9	288	2 54	-4	5 40	?L	(5.7)	7.7
Lemberg	12.4	344	—	—	e 5 28	-1	e 7.6	8.5
Rocca di Papa N.	13.4	292	e 3 22	+4	6 4	+11	7.8	8.8
Vienna	14.0	322	i 3 28	+2	6 14	+6	i 7.0	8.2
Padova	15.1	305	3 38	-2	7 43	?L	(7.7)	—
Moncalieri	17.7	300	e 4 4	-9	6 38	-55	9.3	11.9
Zurich	17.9	308	e 4 19	+3	—	—	—	—
Strasbourg	18.9	311	i 4 33	+5	e 7 57	-3	e 9.7	12.0
Besançon	19.5	306	5 17	+42	10 36	?L	(10.6)	10.7
Hamburg	20.5	326	e 4 51	+4	e 8 37	+3	e 11.8	13.4
Algiers	21.0	275	4 53	0	—	—	9.7	—
Uccle	21.9	314	5 4	0	e 8 56	-7	e 10.7	12.3
De Bilt	22.1	318	5 4	-2	9 7	0	11.2	14.4
Paris	22.2	308	e 5 10	+3	e 8 59	-10	11.7	13.7
Tortosa	22.5	287	5 10	-1	(e 9 25)	+10	e 9.4	16.0
Oxford	25.5	313	i 5 38	-5	e 10 3	-10	14.9	16.3
Edinburgh	28.1	320	—	—	—	—	14.7	16.5
Coimbra	29.3	287	—	—	8 38	? e	17.4	—

Additional readings: Helwan readings given as PN and PE respectively.
 Rocca di Papa iPE = +3m.14s., iPN = +3m.17s., L = +9.6m. Vienna
 iZ = +3m.32s., iN = +3m.58s. + 4m.9s., and + 4m.31s. Strasbourg MN =
 +11.6m., T₀ = 15h.17m.39s. Hamburg i = +10m.6s., MZ = +13.8m.,
 MN = +16.0m., T₀ = 15h.17m.29s. De Bilt MN = +12.4m. Tortosa
 S? = +7m.3s. (?PR₁).

Sept. 28d. Readings also at 0h. (Ottawa), 1h. (Manila), 11h. (De Bilt and Helwan),
 17h. (Azores), 18h. (San Fernando), 19h. (Rio Tinto).

Sept. 29d. Readings at 3h. (Apia), 4h. (Florence), 7h. (near Pompeii and Rocca
 di Papa), 9h. (Padova), 11h. (Azores), 12h. (Taihoku and near Tucson),
 17h. (near La Paz), 20h. (San Fernando).

Sept. 30d. Readings at 1h. (Lick), 5h. (La Paz), 10h. (Riverview), 12h. (Taihoku),
 14h. (Uccle, Taihoku, Manila, and near Zi-ka-wei), 15h. (De Bilt and
 Helwan), 17h. (Batavia), 19h. (San Fernando).

The International Seismological Summary for 1920 October, November, December.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

At the meeting of the Geodetic and Geophysical Union in Madrid in October, 1924, the question was raised which were the most suitable tables to adopt; and whether a Committee should be appointed to report on the improvement of the tables. It was replied that the time was scarcely yet come, for if the estimates recently made for depth of focus are confirmed, drastic revision of the tables is necessary. Meanwhile the tables adopted in the Summary, which have been given many times in a brief, and recently in an expanded form, are good enough as provisional tables. M. Somville expressed the opinion that those of Dr. Klotz are, however, rather better. An opportunity of testing this statement is provided by the great Kansu earthquake of December 16, and in the full discussion of that shock is given an examination of the merits of Dr. Klotz's tables. They do not seem to bear out the statement of M. Somville, and it is claimed that our best course at present is to continue with the adopted (admittedly imperfect, but still fairly good) tables, to which already a great many observations have been referred.

In the present number 27 new epicentres are adopted, and 42 old ones.

There is but one case of abnormal focus, on Nov. 24, depth $= +0.010$ ($14^{\circ}3S$. $64^{\circ}2W$.). It is not possible to discuss directly the depth of focus for the great Kansu earthquake, since there are no observations very near the epicentre; but available evidence supports the hypothesis that the focal depth was normal.

H. H. TURNER.

University Observatory, Oxford.

1925 January 24.

1920 OCTOBER, NOVEMBER, & DECEMBER.

Oct. 1d. 18h. 49m. 40s. Epicentre $17^{\circ}0'N$. $99^{\circ}0'W$.

A = -150, B = -945, C = +292; D = -988, E = +156;
G = -046, H = -289, K = -956.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Oaxaca		2.1	90	0 52	-19	(0 52)	-6	1.5	1.7
Tacubaya		2.4	356	1 17	+40	(1 17)	+11	2.0	2.2
Mazatlan		9.3	313	4 28	?L	—	—	(4.5)	6.2
Tucson	E.	18.7	327	—	—	e 8 30	+35	10.5	11.6
	N.	18.7	327	e 4 45	+20	—	—	10.4	11.6
Chicago		26.7	19	5 54	-1	10 39	+4	e 16.4	—
Lick	E.	28.5	320	—	—	—	—	e 17.6	—
Ann Arbor		28.5	24	—	—	(11 8)	0	11.1	—
Cheltenham	N.	29.1	37	e 11 25	?S	(e 11 25)	+6	22.4	24.8
Georgetown		29.1	37	—	—	e 11 29	+10	27.0	—
Washington		29.1	37	6 26	+7	11 26	+7	e 19.1	—
Berkeley		29.2	320	—	—	—	—	e 17.0	—
Ottawa		34.4	30	—	—	e 12 45	-1	e 22.2	—
Victoria		37.2	333	20 30	?L	—	—	(20.5)	23.0
La Paz		45.2	136	8 34	0	17 4	+106	28.6	33.3
Honolulu		55.6	284	—	—	—	—	e 26.9	32.3
Edinburgh		79.2	36	—	—	—	—	52.3	—
Oxford		81.4	39	—	—	e 22 53	+14	—	—
Rio Tinto		81.5	53	32 20	?	—	—	—	33.8
Paris		84.7	40	—	—	—	—	48.3	—
Uccle		85.0	39	—	—	e 23 20	+1	e 43.3	—
De Bilt		85.1	37	—	—	e 23 37	+17	e 51.3	55.0
Strasbourg		88.0	40	—	—	e 23 50	-2	e 51.3	—
Rocca di Papa		94.0	44	—	—	e 24 20	-36	—	34.3
Helwan		113.0	46	e 62 20	?L	—	—	(62.3)	—

Additional readings and notes: Oaxaca gives all its readings 3m. late, PZ = -0m.51s., MZ = +1.8m. Lick eLN = +17.7m. Cheltenham eN = +19m.55s. Berkeley eN = +17m.14s. The S phase of La Paz is uncertain, and is taken to be SR₁, T₀ = 18h.47m.2s. De Bilt eSR₁ = +29m.13s. Helwan PN = +66m.20s.

Oct. 1d. Readings also at 2h. (Helwan), 4h. (La Paz), 5h. (Helwan, Riverview, De Bilt, and Uccle); 15h. (Apia and near Kobe), 23h. (Tacubaya).

Oct. 2d. Readings at 0h. (Lick, San Fernando, and near Tacubaya (2)), 2h. (La Paz), 3h. (near Tacubaya (2)), 5h. (La Paz and near Tacubaya), 9h. (La Paz, Florence, and Manila), 12h. (near Mizusawa and near Tacubaya), 13h. (Batavia and Taihoku), 14h. (La Paz), 15h. (near Vieques), 17h. (Taihoku), 21h. (Apia).

Oct. 3d. Readings at 0h. (San Fernando), 3h. (near Pompeii), 5h. (Chicago and Honolulu), 10h. (Helwan), 13h. (Florence), 14h. (Riverview), 16h. (Taihoku and near Tokyo), 17h. (near Tokyo), 20h. (Rocca di Papa), 21h. (near Manila).

Oct. 4d. Readings at 2h. (San Fernando), 3h. (Manila and Zi-ka-wei), 4h. and 5h. (Tacubaya and Manila), 17h. (Riverview and Tacubaya), 22h. (near Batavia), 23h. (Apia).

Oct. 5d. 19h. 4m. 25s. Epicentre $36^{\circ}5'N$. $122^{\circ}0'W$.

A = -426, B = -682, C = +595 ; D = -848, E = +530 ;
 G = -315, H = -504, K = -804.

	Δ °	Az. °	P. m. s.	O - C. s.	L. m.	M. m.
Lick	0.9	18	i 0 14	0	i 0.4	0.7
Berkeley	1.4	352	e 0 24	+ 3	—	1.5
z.	1.4	352	e 0 23	+ 2	—	1.2
Victoria	11.9	355	—	—	6.4	8.4
Chicago	27.0	68	—	—	e 13.0	—
Ann Arbor	29.9	67	—	—	16.2	—
Georgetown	35.3	72	—	—	e 14.9	—
Ottawa	35.5	61	—	—	e 18.1	—

Additional Readings : Chicago gives also eL = +15.6m. Ann Arbor LN = +16.0m. Ottawa eL? = +18.6m., L = +19.9m.

Oct. 5d. Readings also at 1h. (La Paz). 6h. (San Fernando and near Tacubaya and Oaxaca), 12h. (La Paz), 14h. (Florence), 16h. and 19h. (near Tacubaya), 20h. (San Fernando), 21h. (Taihoku), 22h. (near Algiers).

Oct. 6d. Readings at 4h. (Lick), 7h. (Rio Tinto), 8h. (Helwan), 16h. (Tacubaya), 22h. (San Fernando and near Padova).

1920. Oct. 7d. 20h. 54m. 0s. Epicentre $12^{\circ}0'S$. $69^{\circ}0'W$.

(as on 1920 Feb. 28d.).

A = +351, B = -913, C = -208 ; D = -934, E = -358 ;
 G = -075, H = +194, K = -978.

The values of T_0 inferred from S - P are curiously discordant from that assigned by La Paz. Half a dozen stations (including De Bilt) favour a value greater by about 40 sec.; and another half dozen (including Uccle) favour a value less by 30 sec. Was there more than one shock ?

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
La Paz	4.6	169	i 1 17	+ 6	2 15	+ 9	2.5	3.1
Balboa Heights	E. 23.5	333	5 6	-17	9 4	-31	—	9.7
N. 23.5	333	—	—	—	9 10	-25	—	10.2
Vieques	E. 30.4	8	—	—	—	—	14.1	15.0
Georgetown	E. 51.5	352	e 9 21	+ 4	i 17 13	+35	e 25.5	—
Washington	51.5	352	9 6	-11	16 26	-12	24.3	—
Ithaca	54.9	355	e 10 1	+23	e 17 18	- 2	24.2	—
Ann Arbor	E. 56.1	350	10 0	+13	17 36	+ 1	25.4	28.2
N. 56.1	350	—	—	—	17 48	+13	25.7	—
Chicago	56.4	345	9 54	+ 6	17 12	-27	23.8	27.4
Toronto	56.5	351	—	—	15 0	?	23.4	24.8
Ottawa	57.7	355	10 31	+34	17 51	- 4	28.0	—
San Fernando	76.3	48	12 24	+27	21 54	+13	—	53.0
Coimbra	E. 76.5	43	e 12 31	+33	21 47	+ 4	e 38.7	45.1
N. 76.5	43	e 12 15	+17	—	—	e 30.9	—	—
Rio Tinto	76.6	47	23 0	?	(23 0)	+76	—	52.0
Victoria	77.1	328	12 18	+16	21 53	- 3	35.2	40.1
Granada	78.5	49	i 12 16	- 6	i 22 45	+39	—	—
Cape Town	81.2	124	22 48	?	(22 48)	+11	—	23.8
Tortosa	82.9	46	12 29	- 6	23 8	+12	36.3	49.0
Algiers	83.6	51	—	—	(24 0)	+55	24.0	46.0
Barcelona	84.3	47	e 0 52	?	(22 35)	-36	e 22.6	37.6
Oxford	86.2	35	12 53	- 1	23 2	-30	—	52.2
Stonyhurst	86.5	34	e 22 48	?	(e 22 48)	-48	—	54.0
Kew	86.6	35	25 0	?	(25 0)	+83	—	55.0
Eskdalemuir	86.7	31	e 13 0	+ 3	24 45	+67	39.0	—
Edinburgh	87.0	31	—	—	23 0	-41	—	30.5

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Paris	87.3	40	—	—	e 23 44	0	50.0	—
Uccle	89.1	39	e 12 54	-17	23 58	-6	e 38.0	52.4
Moncalieri	89.3	43	e 16 16	?PR ₁	30 35	?SR ₁	43.0	—
De Bilt	90.0	38	e 13 35	+19	e 24 14	0	e 38.0	e 49.9
Strasbourg	90.4	40	e 13 30	+12	i 25 40	+82	e 38.0	51.4
Florence	91.4	46	24 0	?S	(24 0)	-28	—	32.0
Rocca di Papa N.	91.9	48	e 13 18	-8	24 30	-4	e 40.6	—
Hamburg	93.3	36	e 17 34	?PR ₁	e 24 0	-48	e 41.0	55.0
Honolulu	93.5	292	e 9 18	?	23 24	-87	41.9	49.9
Vienna	95.9	42	e 13 35	-13	e 24 24	-51	e 44.0	57.5
Helwan	104.8	62	24 0	?S	(24 0)	-160	—	—
Colombo	148.8	98	42 0	?SR ₁	—	—	(65.0)	—
Batavia	161.3	167	e 21 54	?	—	—	—	—

Additional readings: Toronto gives also $i = +6m.54s.$ and $+19m.42s., eL = +46.9m.$ Ottawa $iE = +18m.33s.$ and $+20m.11s., eLE = +25.3m., L = +36.0m.$ and $+40.0m., T_0 = 20h.55m.18s.$ Coimbra $LN = +32.0m., T_0 = 20h.54m.41s.$ Uccle $PR_1 = +16m.42s., i = +26m.4s., T_0 = 20h.53m.42s.$ De Bilt $ePR_1 = +16m.45s., e = -26m.12s., MN = +51.8m., T_0 = 20h.54m.53s.$ Rocca di Papa $ePE = +13m.0s., PR_1 = +17m.36s., eLE = +31.6m.$ Hamburg $MN = +42.8m.$ Honolulu $PR_1 = +16m.30s.$ Colombo $+83m.0s.$

Oct. 7d. Readings also at 0h. (Batavia), 7h. (Rio Tinto, Uccle, and near Algiers and Tortosa), 8h. (near Florence, Zurich, and Rocca di Papa), 9h. (near Tokyo), 11h. (Zi-ka-wei), 18h. (Helwan, Nagasaki, and Algiers), 19h. (Taihoku), 23h. (Batavia).

Oct. 8d. 16h. 50m. 45s. Epicentre $16^\circ 0'N. 90^\circ 0'W.$

A = -000, B = -0.961, C = +0.276; D = -1.000, E = -000;
G = -000, H = -0.276, C = -0.961.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Oaxaca	6.6	280	2 20	+39	(2 50)	-10	2.8	2.9
Mobile N.	14.7	6	2 58	-37	5 40	-45	6.5	6.7
Vieques E.	23.4	81	e 6 36	+75	—	—	e 10.2	—
Tucson E.	24.9	314	e 5 29	-8	9 12	-49	12.1	12.6
N.	24.9	314	5 29	-8	9 14	-47	12.1	13.0
Georgetown E.	25.5	24	e 6 2	+19	10 56	+43	20.6	—
Washington	25.5	24	5 39	-4	10 47	+34	—	16.7
Cheltenham	25.5	24	6 3	+20	10 19	+6	—	17.8
Chicago	25.8	4	5 33	-13	10 33	+15	13.6	—
Ann Arbor E.	26.8	10	6 9	+13	10 57	+20	15.2	17.4
N.	26.8	10	6 21	+25	11 3	+26	15.4	18.0
Ithaca	28.8	21	e 6 45	+29	e 10 37	-36	—	—
Toronto	29.0	16	—	—	e 10 21	-56	e 18.0	19.2
Ottawa	31.7	20	6 31	-13	11 55	-8	e 15.7	—
Northfield	31.7	25	—	—	—	—	e 15.2	—
Berkeley	35.8	316	e 6 52	-28	—	—	—	—
La Paz	39.0	145	7 45	-1	e 13 49	-3	19.0	20.4
Victoria	42.3	330	—	—	17 2	?SR ₁	21.5	26.3
Honolulu	64.2	286	—	—	e 19 15	0	e 27.2	—
Edinburgh	75.0	37	e 11 48	-1	21 40	+14	37.2	41.2
Esksdalemuir	75.0	37	e 11 54	+5	21 44	+18	36.2	—
Oxford	76.7	40	12 2	+3	21 50	+5	37.6	43.8
Paris	79.7	42	e 12 15	-2	e 22 21	1	40.2	44.2
Uccle	80.3	40	e 12 19	-2	e 22 30	-3	e 38.2	42.2
De Bilt	80.5	39	12 22	0	22 34	-5	e 38.2	42.7
Hamburg E.	82.9	37	e 12 32	-3	i 22 51	-5	e 39.2	46.2
Algiers	82.9	54	—	—	e 24 49	+113	44.2	—
Strasbourg	83.0	42	i 12 35	-1	22 52	-5	38.2	46.8
Rocca di Papa	88.5	17	e 12 57	-11	—	—	—	—
Vienna	88.6	40	13 2	-6	i 23 29	-30	e 42.2	50.8

Additional readings: Oaxaca gives also $MZ = +3.1m.$ Georgetown $eLE = +62.2m., T_0 = 16h.50m.36s.$ Chicago $L? = +15.2m., T_0 = 16h.49m.59s.$ Ann Arbor $LE = +15.0m.$ Toronto $S? = +13m.45s. (SR_1).$ Berkeley $eZ = +6m.59s.$ Victoria $L = +23.7m.$ Esksdalemuir $e = +8m.57s.$ Paris $iS = +22m.31s., T_0 = 16h.50m.52s.$ De Bilt $MN = +43.7m., T_0 = 16h.50m.53s.$ Rocca di Papa $eN = +13m.21s.$ Vienna $i = +13m.49s.$

Oct. 8d. Readings also at 1h. (Helwan), 4h. (Zi-ka-wei), 7h. (Zi-ka-wei, Manila (2), Taihoku, and Batavia), 8h. (Batavia, Zi-ka-wei, Helwan, Manila (2), Ucele (2), and De Bilt (2)), 9h. (2), 11h., and 13h. (Manila), 14h. (De Bilt and Manila (2)), 15h. (La Paz and Helwan), 16h. (De Bilt and Helwan), 19h. (Batavia), 20h. (Mauritius), 21h. (Taihoku and San Fernando).

Oct. 9d. Readings at 3h. (La Paz), 5h. (Manila), 6h. (Zi-ka-wei), 8h. (Manila), 11h. (Batavia, Manila, and La Paz), 12h. and 15h. (La Paz), 17h. (Algiers), 20h. (San Fernando), 21h. (Barcelona).

Oct. 10d. 19h. 43m. 0s. Epicentre $13^{\circ}08'. 60^{\circ}0'W$.

A = +.487, B = -.844, C = -.225; D = -.866, E = -.500;

G = -.113, H = +.195, K = -.974.

This solution satisfies the La Paz and Tortosa observations, but the epicentre seems too near Europe to suit the L observations at Ucele and De Bilt. If we could ignore the Tortosa observations, an epicentre at $14^{\circ}08'. 76^{\circ}0'W$. would satisfy the European observations of L.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	8.6	245	i 2 7	- 3	3 46	- 7	4.1	4.2
San Fernando	70.8	44	48 0	?L	—	—	(48.0)	—
Rio Tinto	71.2	42	49 0	?L	—	—	(49.0)	56.0
Tortosa	77.6	42	e 12 0	- 5	e 22 0	+ 4	e 37.0	53.9
Paris	82.8	36	—	—	—	—	53.0	—
Ucele	84.7	36	—	—	—	—	e 48.0	—
De Bilt	85.8	35	—	—	—	—	e 48.0	55.6
Rocca di Papa	86.2	46	—	—	—	—	e 62.0	—
Hamburg	89.1	34	—	—	—	—	54.0	59.0
Helwan	97.6	61	56 0	?L	—	—	(56.0)	—
Honolulu	102.1	290	—	—	—	—	e 45.8	52.0

Additional readings: La Paz gives i - +2m.22s. and +3m.31s., $T_0 = 19h.43m.6s$.
De Bilt MN = +52.3m. Helwan PE = +60m.0s.

Oct. 10d. Readings also at 5h. (Helwan), 6h. (La Paz), 9h. (Batavia, Colombo, and Rio Tinto), 13h. (La Paz (2)), 14h. (Florence), 17h. (La Paz), 18h. (Manila and Moncalieri), 20h. (La Paz), 23h. (Florence).

Oct. 11d. Readings at 7h. (Stonyhurst (6)), 14h. (Barcelona), 22h. (Apia).

Oct. 12d. 6h. 54m. 40s. $35^{\circ}7'N. 81^{\circ}0'E$.

A = +.127, B = +.802, C = +.584; D = +.988, E = -.156;

G = +.091, H = +.576, K = -.812.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Simla	5.6	216	1 32	+ 5	—	—	—	2.9
Calcutta	14.7	152	3 38	+ 3	6 2	-23	8.0	8.8
	14.7	152	3 44	+ 9	6 14	-11	8.2	9.0
Bombay	18.3	205	7 33	?S	(7 33)	-14	—	10.1
Kodaikanal	25.7	188	13 8	?L	—	—	22.8	26.4
Colombo	28.8	182	16 20	?L	—	—	(16.3)	21.3
Zi-ka-wei	33.8	85	—	—	e 13 14	+36	—	—
Taihoku	36.3	95	—	—	—	—	e 20.3	—
Manila	41.5	110	e 8 20	+13	—	—	—	—
Vienna	48.1	308	8 52	- 3	15 49	- 6	e 26.0	30.9
Hamburg	51.2	315	e 9 15	+ 1	e 16 34	0	e 28.5	32.6
Rocca di Papa	52.2	299	i 9 26	+ 5	e 16 44	- 2	e 32.0	35.0
	52.2	299	e 9 20	- 1	i 16 44	- 2	e 28.8	34.6
Florence	52.6	302	15 45	?S	(15 45)	-66	—	30.3

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°		m. s.	s.	m. s.	s.	m.	m.
Strasbourg	53.7	309	9 31	0	—	—	29.3	—
De Bilt	54.4	314	17 15	?S	(17 15)	+ 1	27.3	30.9
Moncalieri	54.7	305	—	—	e 17 19	+ 2	28.6	35.8
Uccle	55.2	312	e 9 40	0	e 17 25	+ 1	e 27.3	31.5
Paris	56.9	310	e 17 45	?S	(e 17 45)	0	30.3	—
Kew	57.8	315	—	—	—	—	—	34.3
Edinburgh	58.0	320	—	—	e 18 8	+ 9	34.3	36.8
Eskdalemuir	58.2	320	—	—	i 18 8	+ 7	28.3	—
Stonyhurst	58.2	316	e 23 50	?SR ₁	—	—	34.3	36.3
Oxford	58.3	315	—	—	18 7	+ 4	30.8	35.2
Barcelona	59.7	301	—	—	—	—	e 26.9	35.3
Tortosa	61.1	301	11 51	+91	18 47	+10	25.6	37.4
Granada	65.6	300	11 42	+53	20 2	+30	—	—
Rio Tinto	67.4	301	39 20	?L	—	—	(39.3)	42.3
Coimbra	E. 67.5	305	e 15 42	?	—	—	—	39.7
	N. 67.5	305	e 13 20	?	e 20 2	+ 6	e 34.4	39.8
San Fernando	67.8	300	29 0	?L	—	—	38.3	42.3
Victoria	93.2	15	49 16	?L	—	—	52.7	59.1
Toronto	98.6	346	—	—	—	—	e 59.2	—
Chicago	101.8	350	—	—	—	—	e 51.3	—
La Paz	146.5	297	19 55	[+ 4]	—	—	76.3	82.5

Additional readings: Hamburg gives also eSR₁ = +21m.2s., MZ = +34.8m., T₀ = 6h.54m.44s. Rocca di Papa eLN = +30.9m. De Bilt eSR₁ = +21m.27s., eN = +21m.56s., MN = +30.8m. Moncalieri S? = +22m.58s., MN = +32.6m. Paris eS = +23m.5s. Oxford SR₁ = +24m.15s. San Fernando MN = +43.3m. Chicago L = +55.3m. and +65.3m.

Oct. 12d. Readings also at 0h. (Colombo and Algiers), 4h. (Taihoku), 7h. (Manila, near Athens, and near Calcutta), 8h. (Batavia, Barcelona, Tortosa, Stonyhurst (2), Manila, Taihoku (2), Zi-ka-wei (2), De Bilt, and La Paz, possibly from the origin of 6h., but the evidence for a repetition insufficient), 9h. (De Bilt, Uccle, Zi-ka-wei, Rocca di Papa, Riverview, and Strasbourg), 17h. (Point Loma, and near Berkeley), 19h. (near Tokyo), 23h. (San Fernando and near Mizusawa).

Oct. 13d. 23h. 11m. 55s. Epicentre 34° 7'N. 19° 3'E.

A = +.776, B = -.272, C = +.569; D = +.330, E = -.944;
G = +.537, H = -.188, K = -.822.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°		m. s.	s.	m. s.	s.	m.	m.
Athens	4.8	47	e 1 23	+ 9	e 2 1	-10	i 2.1	4.8
Pompeii	7.2	330	1 25	-24	2 45	-30	—	—
Rocca di Papa	8.8	326	i 2 5	- 8	i 4 5	+ 7	—	—
Helwan	N. 11.2	112	6 5	?L	—	—	(6.1)	—
Moncalieri	13.6	323	e 3 21	0	6 33	+35	9.2	—
Vienna	13.7	352	3 12	-10	—	—	—	8.1
Tortosa	16.0	299	4 0	+ 8	6 47	- 8	7.1	8.2
Strasbourg	16.3	332	e 3 50	- 6	e 6 20	-42	10.1	—
Granada	18.7	284	4 28	+ 3	8 1	+ 6	—	—
Uccle	19.4	331	e 4 27	- 7	e 8 7	- 3	10.1	—
Hamburg	20.1	344	e 4 37	- 5	—	—	—	14.1
De Bilt	E. 20.2	334	4 43	0	8 26	- 1	10.7	12.7
	N. 20.2	334	—	—	—	—	11.2	12.3
Oxford	22.6	325	—	—	e 9 15	- 2	—	—
Edinburgh	26.2	331	—	—	10 5	-21	—	—

Additional readings: Athens gives also MN = +2.9m. Helwan PE = +9m.5s.

Oct. 13d. Readings also at 4h. (La Paz, Manila, and De Bilt), 5h. (near Tokyo), 11h. (Batavia), 15h. (La Paz and Manila), 18h. (Barcelona), 21h. (Uccle and De Bilt), 22h. (San Fernando, Manila, and Lick).

Oct. 14d. Readings at 1h. (Florence), 10h. (La Paz), 15h. (La Paz and near Mizusawa), 19h. (near Tokyo), 23h. (San Fernando).

Oct. 15d. 11h. 9m. 50s. Epicentre $43^{\circ}\cdot 8\text{N}$. $11^{\circ}\cdot 2\text{E}$. (as on 1920 Sept. 16d.).

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Florence	0·0	—	0 0	0	—	—	—	0·3
Padova	1·7	17	0 27	+ 1	0 45	- 3	—	—
Rocca di Papa	2·3	152	e 1 4	?S	(e 1 4)	+ 1	e 4·2	5·2
Zurich	4·0	332	e 0 53	- 9	—	—	—	—
Vienna	5·7	37	2 38	?S	(2 38)	+ 2	—	4·2

Florence gives other readings at +12s. and +18s. Zurich eN = +0m.48s.

Oct. 15d. 14h. 7m. 37s. Epicentre $75^{\circ}\cdot 5\text{S}$. $150^{\circ}\cdot 0\text{E}$.

A = -·217, B = +·125, C = -·968; D = +·500, E = -·866;

G = +·838, H = -·484, K = -·250.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Adelaide	40·9	348	i 13 41	?S	(i 13 41)	-39	i 20·5	24·7
Riverview	41·7	2	e 8 9	0	e 14 32	+ 1	e 19·0	21·1
Sydney	41·7	2	14 41	?S	(14 41)	+10	19·4	20·4
La Paz	85·1	144	23 13	?S	(23 13)	- 7	—	—
Manila	91·8	333	e 15 23	+117	—	—	—	—
Honolulu	102·0	50	e 20 59	?	—	—	29·8	40·1
Helwan	125·9	250	79 23	?L	—	—	(79·4)	—
Victoria	135·6	71	—	—	—	—	48·6	51·0
Rio Tinto	140·8	209	90 23	?L	—	—	(90·4)	95·4
Rocca di Papa	141·5	232	—	—	e 59 23	?	82·2	—
Toronto	141·8	118	—	—	—	—	e 46·9	—
Tortosa	142·8	219	—	—	—	—	e 69·4	88·1
Moncalieri	145·5	228	—	—	e 66 35	?L	83·4	—
Strasbourg	149·0	230	—	—	—	—	e 71·4	—
Paris	150·2	225	—	—	e 26 18	—	78·4	83·4
Uccle	151·8	229	—	—	—	—	e 68·4	—
De Bilt	152·9	231	—	—	—	—	e 71·4	82·6

Additional readings: Riverview gives also PS = +14m.58s., MZ = +20·1m., MN = +20·4m. La Paz i = +26m.41s. De Bilt MN = +76·9m..

Oct. 15d. Readings also at 0h. (Lick), 6h. (La Paz), 8h. (Lick), 9h. (Helwan), 13h. (La Paz), 15h. (near Mizusawa), 17h. (Florence), 19h. (San Fernando), 22h. (Mauritius), 23h. (La Paz).

Oct. 16d. 11h. 36m. 30s. Epicentre $50^{\circ}\cdot 4\text{N}$. $31^{\circ}\cdot 6\text{W}$.

A = +·543, B = -·334, C = +·770; D = -·524, E = -·852;

G = +·656, H = -·404, K = -·637.

(The epicentre $51^{\circ}\cdot 0\text{N}$. $34^{\circ}\cdot 0\text{W}$. of 1919 August 18 is found to be definitely too far away).

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Edinburgh	17·8	61	4 15	0	—	—	—	12·0
Oxford	19·0	74	—	—	—	—	—	11·3
Paris	22·0	81	e 5 8	+ 3	e 9 7	+ 2	11·2	12·5
Uccle	22·6	75	e 5 5	- 7	e 9 16	- 1	e 10·5	12·4
De Bilt	22·8	72	5 15	0	e 9 21	0	10·5	14·8
Strasbourg	25·3	79	5 35	- 6	9 59	-10	13·6	14·5
Hamburg z.	25·4	67	e 5 24	-18	—	—	—	13·5
Moncalieri	26·7	86	—	—	e 10 34	- 1	13·9	—
Vienna	30·8	75	—	—	—	—	e 16·0	—
Rocca di Papa	31·4	89	—	—	—	—	e 14·0	18·6

Additional readings: De Bilt gives MN = -12·9m., $T_0 = 11\text{h.}36\text{m.}37\text{s.}$

Oct. 16d. Readings also at 2h. (near Tacubaya), 4h. (Rocca di Papa), 10h. (Manila), 22h. (San Fernando).

Oct. 17d. Readings at 5h. (La Paz), 7h. (San Fernando).

1920. Oct. 18d. 8h. 11m. 30s. Epicentre **46°0N. 149°0E.**

(as on 1919 Feb. 12d.).

A = -·596, B = +·358, C = +·719; D = +·515, E = +·857;

G = -·617, H = +·370, K = -·695.

		Δ	Az.	P.	O-C	S.	O-C	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Ootomari		4.4	281	0 57	-11	—	—	2.5	3.3
Mizusawa	E.	8.9	223	2 17	+ 2	3 47	-14	—	—
	N.	8.9	223	2 18	+ 3	3 51	-10	—	—
Tokyo		12.4	218	3 5	0	4 1	?	4.5	7.1
Osaka		15.3	227	3 51	+ 8	(6 39)	0	6.6	9.6
Kobe	E.N.	15.4	228	3 48	+ 4	(6 45)	+ 4	6.8	7.1
Nagasaki		19.8	235	e 4 47	+ 8	(8 25)	+ 6	8.4	8.5
Zi-ka-wei		25.9	245	e 5 35	-12	9 39	-41	—	16.4
Taihoku		30.3	235	7 11	+40	(11 50)	+11	11.8	—
Manila		39.2	226	e 7 32	-16	(13 28)	-26	i 17.5	17.6
Honolulu		49.3	102	i 8 48	-14	i 15 48	-22	27.5	34.3
Calcutta	E.	53.8	267	9 36	+ 4	(17 12)	+ 6	17.2	—
Victoria		56.2	53	(9 32)	-15	9 32	?P	16.9	25.3
Simla		56.2	280	9 54	+ 7	17 30	- 6	—	31.7
Berkeley	E.	63.0	62	e 10 34	+ 2	i 19 0	- 1	—	19.0
	N.	63.0	62	e 10 32	0	i 18 59	- 2	—	19.1
Batavia		64.2	228	i 10 45	+ 6	i 19 11	- 4	e 37.5	41.4
Bombay		67.0	275	11 0	+ 2	—	—	—	20.0
Apia		69.4	139	11 0	-13	20 0	-19	30.8	—
Kodaikanal		69.9	266	13 54	?PR ₁	(20 18)	- 7	20.3	22.1
Colombo		70.6	261	11 30	+ 9	(20 30)	- 3	20.5	21.5
Lemberg		73.0	325	i 11 38	+ 2	—	—	e 34.5	39.5
Tucson	E.	73.7	60	e 11 42	+ 2	21 10	0	—	—
	N.	73.7	60	11 41	+ 1	i 21 3	- 7	—	—
Dyce	E.	74.1	345	i 11 54	+11	21 20	+ 5	—	—
Hamburg		74.5	337	i 11 51	+ 5	i 21 22	+ 2	e 37.3	41.5
Edinburgh		75.5	345	11 54	+ 2	—	—	36.5	46.7
Vienna	E.	77.2	330	i 12 6	+ 4	i 21 49	- 2	e 38.2	43.0
	N.	77.2	330	i 12 4	+ 2	i 21 54	+ 3	—	52.8
De Bilt		77.2	335	i 12 5	+ 3	i 21 52	+ 1	37.5	43.1
Bidston		77.8	344	12 7	+ 1	22 1	+ 3	—	—
West Bromwich		78.4	343	12 12	+ 3	22 5	0	—	—
Uccle		78.5	335	i 12 11	+ 1	i 22 5	- 1	37.5	43.5
Chicago		78.8	40	12 8	- 4	21 59	-11	38.2	—
Oxford		79.0	342	i 12 16	+ 3	i 22 8	- 4	32.8	48.4
Kew		79.0	342	21 30	?S	(21 30)	-42	—	52.5
Strasbourg	E.	79.7	336	i 12 18	+ 1	i 22 12	- 8	40.5	46.0
	N.	79.7	336	i 12 16	- 1	i 22 14	- 6	40.5	46.2
Riverview		79.8	178	i 12 7	-11	i 22 0	-21	e 35.6	45.2
Sydney		79.8	178	21 54	?S	(21 54)	-27	43.8	46.5
Ann Arbor	N.	80.0	37	12 0	-19	21 54	-29	46.0	—
Ottawa	Z.	80.5	29	i 12 20	- 2	i 22 19	-10	e 40.9	—
Zurich		80.5	333	i 12 22	0	i 22 24	- 5	—	—
Toronto		80.6	33	14 54	+151	23 12	+42	31.3	54.4
Paris		80.8	335	i 12 23	- 1	i 22 26	- 7	39.5	42.5
Padova	E.N.	81.1	330	12 19	- 7	22 26	-10	38.7	53.4
Besançon		81.4	335	12 27	0	22 34	- 5	38.5	—
Adelaide		81.5	189	e 12 24	- 4	i 22 12	-29	—	42.0
Milan		82.0	332	12 22	- 8	22 33	-13	—	23.2
Northfield		82.6	28	12 30	- 4	22 40	-13	38.5	—
Florence		82.8	330	12 31	- 4	22 39	-16	—	22.9
		82.8	330	12 30	- 5	23 5	+10	—	—
Ithaca		82.8	31	12 35	0	22 45	-10	e 40.4	—
Athens		82.9	320	i 12 34	- 1	i 22 44	-12	40.0	45.9
Moncalieri		82.9	333	i 12 33	- 2	i 22 54	- 2	40.5	49.7
Perth		83.5	208	25 30	?	—	—	—	—
Rocca di Papa		84.1	327	i 12 49	+ 6	i 22 54	-15	e 41.0	46.0

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Pompeii		84.2	326	12 30	-13	22 45	-25	38.5	54.5
Halifax	N.	85.0	22	e 12 40	-8	i 22 56	-23	e 41.4	—
Helwan	E.	85.6	310	12 0	-51	—	—	—	23.9
	N.	85.6	310	10 36	?	—	—	—	22.1
Georgetown	F.	85.6	34	i 11 44	-67	i 22 0	-86	e 37.0	—
Washington		85.6	34	12 39	-12	22 54	-32	40.7	—
Cheltenham	N.	85.8	34	i 12 51	-1	i 23 19	-9	e 51.2	58.0
Barcelona		87.7	336	i 12 59	-4	i 23 18	-31	e 42.2	46.5
Tortosa		88.8	336	13 2	-7	23 22	-39	42.5	52.0
Coimbra	E.	91.6	344	13 13	-12	23 42	-49	e 42.7	61.7
	N.	91.6	344	13 13	-12	23 38	-53	46.4	55.2
Algiers		91.8	332	i 13 16	-10	i 23 39	-54	41.5	52.5
Granada		93.3	338	i 13 18	-16	i 23 41	-67	—	—
Rio Tinto		93.4	341	25 30	?S	(25 30)	+41	—	66.5
San Fernando		94.6	340	13 22	-19	24 0	-62	51.8	56.5
Seychelles		95.7	270	84 30	?	—	—	—	86.0
La Paz		137.3	53	i 19 29	[-6]	33 36	?	72.3	75.6
Cape Town		140.9	270	22 59	?PR ₁	—	—	—	97.6

Additional readings: Ootomari gives also MN = +3.0m. Osaka MN = +7.3m. Zi-ka-wei PSN = +10m.24s., SR₁E = +11m.20s. Manila IN = +13m.51s., iE = +14m.16s., iN = +15m.2s., iE = +15m.39s., T₀ = 8h.11m.33s. Calcutta PN = +9m.42s. Victoria P = +4m.28s. Berkeley iS?V = +19m.1s., T₀ = 8h.11m.37s. Batavia iE = +13m.45s., iN = +14m.19s., e = +40m.30s., T₀ = 8h.11m.51s. Apia L = +28.3m. Dyce SN = +21m.24s. Hamburg iPZ = +11m.50s., iSN = +21m.23s., T₀ = 8h.11m.46s.. Edinburgh PR₁ = +14m.53s., PR₂ = +17m.54s., SR₁ = +27m.40s., SR₂ = +31m.54s. De Bilt MN = +41.1m., T₀ = 8h.11m.46s. Uccle MN = +45.9m., epicentre 46° 3N. 148° 5E., T₀ = 8h.11m.45s. Chicago PR₁ = +15m.9s., L = +50.5m., T₀ = 8h.11m.45s. Riverview iP = +12m.9s., iPR₁ = +15m.11s., PS = +22m.48s., SR₁ = +27m.37s., MZ = +38.6m., MN = +46.1m., T₀ = 8h.11m.37s. Epicentre 46° 0N. 151° 0E. Sydney S = +31m.54s. (SR₁). Ottawa LV = +43.5m., L rep. = +118.5m., T₀ = 8h.11m.49s. Toronto i = +6m.6s. and +15m.54s., eL = +46.9m., L = +92.0m. Adelaide i = +23m.6s., e = +28m.18s. Ithaca PR₁ = +15m.49s. Athens PR₂E = +18m.12s., MN = +50.0m., T₀ = 8h.11m.51s. Moncalieri MN = +56.5m. Rocca di Papa L = +35.0m. Georgetown LE = +47.5m. Cheltenham SE = +23m.15s., T₀ = 8h.11m.54s. Barcelona i = +23m.41s. and +23m.59s. Coimbra SR₁N = +25m.26s., SR₁E = +25m.34s., iN = +25m.38s., SR₂E = +26m.57s., T₀ = 8h.12m.15s. San Fernando MN = +61.5m., T₀ = 8h.12m.12s. La Paz PR₁ = +23m.21s., SR₁ = +40m.23s., L = +68.1m. Cape Town (Milne-Shaw) P = +23m.4s.

Oct. 18d. Readings also at 0h. and 4h. (Apia), 5h. (near Mizusawa), 7h. (Florence), 12h. (Batavia, Chicago, Ithaca, Victoria (2), Washington, and Perth), 13h. (Bidston, Oxford, Toronto, Paris, Northfield, Edinburgh, Hamburg, Victoria, Washington, Ithaca, Chicago, La Paz, and De Bilt), 23h. (San Fernando and La Paz).

Oct. 19d. 18h. 24m. 18s. Epicentre 44° 5N. 140° 0E. (as on 1920 Aug. 17d.).

$$A = -.546, B = +.458, C = +.701.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ootomari	2.9	42	0 59	+14	—	—	1.8	—
Mizusawa	5.5	170	1 25	0	2 29	-2	—	—
Tokyo	8.9	181	2 13	-2	2 40	-81	e 4.9	5.0

Mizusawa gives SN = +2m.30s.

Oct. 19d. Readings also at 0h. (Perth), 6h. (Helwan), 12h. (Zante), 14h. (La Paz), 17h. (Taihoku), 18h. (Manila), 21h. (Batavia and near Pompeii and Rocca di Papa).

Oct. 20d. 10h. 2m. 16s. Epicentre 24°-0N. 120°-0E. (as on 1920 June 16d.).

A = -457, B = +792, C = +407; D = +866, E = +500;
G = -204, H = +352, K = -914.

	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Hokoto	0.6	222	0 43	+34	—	—	1.0	3.4
Taihoku	1.8	53	0 30	+2	—	—	0.8	—
Zi-ka-wei	7.3	10	e 1 44	-7	e 3 25	+7	—	4.6
Manila	9.5	172	e 2 33	+10	6 2	?L	7.7	8.0
Nagasaki	12.3	42	e 3 44	+41	—	—	5.8	7.4
Osaka	17.2	48	4 8	+1	—	—	7.8	11.8
Tokyo	20.7	51	e 5 40	+51	e 6 52	-106	e 8.4	9.2
Mizusawa	E. 23.4	45	4 57	-24	8 53	-40	—	—
	N. 23.4	45	5 26	+5	8 54	-39	—	—
Ootomari	29.1	33	6 12	-7	—	—	12.9	17.8
Calcutta	E. 29.1	273	6 8	-11	11 38	+19	17.9	20.0
Batavia	32.8	205	e 6 14	-41	—	—	e 19.7	—
Sinla	38.4	290	e 13 44	?S	(e 13 44)	0	22.2	22.8
Colombo	42.1	252	8 44	+32	14 44	+8	27.7	29.7
Kodaikanal	42.8	260	19 2	?SR ₁	—	—	27.2	28.2
Bombay	44.1	273	10 8	?PR ₁	—	—	—	29.5
Riverview	65.0	152	i 11 27	+42	e 19 14	-11	e 30.3	38.4
Honolulu	74.6	75	e 11 8	-38	21 2	-19	e 36.1	56.8
Helwan	77.2	297	11 44	-18	—	—	—	—
Vienna	80.8	320	12 22	-2	—	—	e 42.7	51.1
Hamburg	81.9	328	—	—	—	—	e 43.7	51.7
De Bilt	85.2	326	12 48	-1	23 22	+1	e 41.7	54.9
Strasbourg	85.7	322	e 12 46	-6	—	—	e 44.7	56.2
Florence	86.1	319	43 44	?L	—	—	(43.7)	54.7
Rocca di Papa	N. 86.1	314	e 13 14	+20	—	—	e 40.7	60.2
Uccle	86.3	327	e 12 46	-9	e 23 16	-17	e 41.7	55.3
Edinburgh	86.8	332	—	—	—	—	44.7	56.6
Besançon	87.4	322	9 5	?	—	—	47.7	—
Moncalieri	87.6	319	e 13 0	-3	23 14	-34	46.7	57.3
Victoria	88.2	37	40 56	?L	—	—	(40.9)	58.2
Kew	88.2	329	49 44	?L	—	—	(49.7)	59.7
Paris	88.4	326	—	—	—	—	e 45.7	55.7
Oxford	88.6	329	—	—	—	—	41.0	57.0
Barcelona	93.0	320	—	—	—	—	e 48.4	51.8
Tortosa	94.3	320	—	—	—	—	e 47.7	62.4
Algiers	95.1	315	—	—	—	—	e 58.7	61.7
Granada	99.1	319	27 2	?S	(27 2)	+75	(38.4)	—
Coimbra	99.8	323	e 24 11	?S	(e 24 11)	-103	51.2	65.8
Rio Tinto	100.5	320	33 44	?SR ₁	—	—	—	69.7
San Fernando	E. 101.0	320	—	—	—	—	61.7	71.7
	N. 101.0	320	—	—	—	—	62.2	66.2
Ottawa	109.1	12	—	—	e 52 14	?L	e 61.2	—
Chicago	109.4	22	—	—	—	—	52.1	—
Toronto	110.0	14	—	—	—	—	e 65.3	68.2
Cape Town	112.2	240	58 20	?L	—	—	(58.3)	71.8
La Paz	169.3	47	20 16	[+2]	—	—	86.9	96.3

Additional readings: Zi-ka-wei gives also ePE = +1m.54s., MN = +5.2m.
 Manila iN = +6m.14s., MN = +9.6m., Osaka MN = +11.5m., Tokyo
 MN = +9.3m., Calcutta LN = +18.4m., Riverview MN = +37.4m.
 Helwan PN = +13m.44s., Hamburg e = +39m.44s., MN = +52.7m.
 De Bilt PR₁ = +16m.9s., SR₁ = +29m.19s., MN = +56.0m., T₀ = 10h.2m.28s.
 Strasbourg MN = +57.1m., Rocca di Papa PR₁N = +15m.47s., Uccle
 ePR₁ = +16m.21s., eSR₁ = +30m.36s., MN = +57.0m., Moncalieri MN
 = +56.9m., Paris MN = +56.7m., Coimbra SN₁ = +34m.14s., MN
 = +65.8m. Also a set of readings ePN? = +8m.57s., S = +24m.21s.
 Chicago L = +64.2m., Toronto eL = +77.0m. and +83.1m.

Oct. 20d. 19h. 16m. 0s. Epicentre 24°-0N. 120°-0E. (as at 10h.).

	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Hokoto	0.6	222	0 1	-8	—	—	0.3	0.8
Taihoku	1.8	53	0 25	-3	(0 43)	-8	0.7	1.1
Zi-ka-wei	7.3	10	e 1 46	-5	e 3 47	+29	(0 3.8)	4.2
Manila	9.5	172	e 2 35	+12	5 39	?L	6.4	9.0
Calcutta	E. 29.1	273	6 0	-19	13 30	?SR ₁	19.0	—
Honolulu	74.6	75	—	—	—	—	e 52.0	58.8
Helwan	77.2	297	35 0	?L	—	—	(35.0)	—

Continued on next page.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Vienna	80.8	320	e 12 24	0	—	—	54.0	—
De Bilt	85.2	326	—	—	23 24	+ 3	e 43.0	54.9
Strasbourg	85.7	322	—	—	—	—	e 46.0	55.0
Rocca di Papa	86.1	314	—	—	e 25 6	+95	e 51.7	58.1
Uccle	86.3	327	—	—	e 23 30	- 3	e 42.0	48.0
Edinburgh	86.8	332	—	—	—	—	55.0	57.0
Kew	88.2	329	—	—	—	—	—	59.0
Paris	88.4	326	—	—	—	—	e 48.0	—
Oxford	88.6	329	—	—	—	—	45.0	57.0
Tortosa	94.3	320	—	—	—	—	e 50.0	62.3
San Fernando	E. 101.0	320	67 0	?L	—	—	(67.0)	69.0
	N. 101.0	320	26 0	?S	(26 0)	- 5	—	72.0
La Paz	169.3	47	20 12	[- 2]	—	—	—	—

Additional readings: Hokoto readings are increased by 30s. Zi-ka-wei gives also ePE = +1m.48s., MN = +5.2m. Manila MN = -8.7m. Calcutta PN = +6m.18s. Honolulu e = +41m.6s. and +44m.0s. Helwan PN = +36m.0s. De Bilt MN = +56.0m.

Oct. 20d. Readings also at 2h. (La Paz), 6h. (Colombo), 10h. (near Kobe), 12h. (Washington), 13h. (Taihoku), 15h. and 16h. (La Paz), 20h. (Taihoku, De Bilt, and Zi-ka-wei), 21h. (Riverview and Taihoku), 23h. (near Tokyo).

Oct. 21d. 18h. 57m. 50s. Epicentre $40^{\circ}0'N$, $20^{\circ}0'E$. (as on 1919 Jan. 5d.).

A = +.720, B = +.262, C = +.643; D = +.342, E = -.940;

G = +.604, H = +.220, K = -.766.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Athens	3.6	123	0 48	- 8	i 1 25	-14	1.6	1.8
Pompeii	4.2	281	1 4	- 1	—	—	—	—
Rocca di Papa	5.8	291	i 1 28	- 2	—	—	e 8.9	—
Florence	7.5	303	1 40	-14	3 10	-14	—	5.9
Padova	8.0	315	2 10	+ 9	5 10	?	—	—
Vienna	8.6	344	2 25	-15	—	—	i 4.8	6.3
Milan	9.6	308	5 44	?L	—	—	(5.7)	9.2
Lemberg	10.2	15	e 3 40	?	—	—	e 6.2	7.0
Moncalieri	10.3	303	e 2 59	+25	4 34	- 3	6.3	9.2
Zurich	11.0	316	e 2 45	+ 1	i 5 4	+10	—	—
Strasbourg	12.2	318	e 3 1	- 1	e 5 47	+23	e 6.5	9.2
Besançon	12.4	310	5 16	?S	(5 16)	-13	8.2	—
Barcelona	13.6	282	—	—	(e 5 43)	-15	e 5.7	9.2
Algiers	13.7	261	e 3 26	+ 4	—	—	—	10.9
Helwan	13.7	134	6 10	?S	(6 10)	+ 9	—	—
Tortosa	14.8	279	3 49	+13	(6 22)	- 5	6.4	11.0
Hamburg	15.2	337	e 3 41	- 1	e 6 44	+ 7	e 8.4	10.2
Paris	15.2	311	e 4 8	+26	i 6 53	+16	8.9	11.2
Uccle	15.3	320	e 3 46	+ 3	e 6 41	+ 2	e 8.2	—
De Bilt	15.8	325	4 4	+15	7 0	+10	e 8.2	11.1
Kew	18.1	316	—	—	—	—	—	15.2
Granada	18.6	269	i 4 26	+ 2	—	—	—	—
Oxford	18.8	316	—	—	8 4	- 6	—	13.6
Bidston	20.6	318	8 40	?S	(8 40)	- 4	(12.8)	—
San Fernando	20.8	269	8 22	?S	(8 22)	-18	—	14.2
Rio Tinto	20.8	272	16 10	?	—	—	—	17.7
Coimbra	21.7	280	—	—	8 43	-16	13.0	14.6
Edinburgh	22.0	324	—	—	—	—	15.2	—

Additional readings: Athens gives also P = -0m.58s., T_0 = 18h.57m.51s. Pompeii reading is diminished by 1h. Rocca di Papa PR_1 = +3m.4s. Vienna iN = +3m.12s., +3m.48s., and +4m.33s., iLN = +5.0m. Moncalieri MN = -8.6m. Strasbourg eSE = +5m.56s., T_0 = 18h.57m.25s. Besançon S = +7m.48s.?, Hamburg eLN = +8m.52s., MZ = +12.2m., T_0 = 18h.57m.44s. De Bilt MN = +11.0m., T_0 = 18h.58m.16s. San Fernando MN = +13.7m. Coimbra LN = +11.8m., MN = +14.2m. These readings are all given for 12h.-13h., and have been increased by 6h. to fit the table.

Oct. 21d. Readings also at 1h. (San Fernando), 8h. (Dehra Dun), 9h. (Florence),
11h. (Helwan and La Paz), 17h. (La Paz), 21h. (Lick), 22h. (Manila).

Oct. 22d. 10h. 51m. 47s. Epicentre $7^{\circ}08'$, $145^{\circ}0'E$. (as on 1918 Sept. 30d.).

A = -0.813 , B = $+0.569$, C = -0.122 ; D = $+0.574$, E = $+0.819$;
G = $+0.100$, H = -0.070 , K = -0.993 .

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	m.	s.	m.	s.	m.	s.	m.	m.
Sydney	27.4	169	9 1	?	—	—	13.9	15.7
Riverview	27.4	169	i 5 46	-16	10 16	-32	e 13.8	17.1
Adelaide	28.5	191	—	—	i 11 1	-7	i 13.9	18.0
Manila	32.2	312	e 6 49	-1	(12 13)	-2	12.2	13.4
Perth	36.9	224	—	—	12 13	-69	—	—
Batavia	37.9	269	e 6 41	-56	e 8 43	?PR ₁	—	13.0
Taihoku	39.5	325	e 7 50	-1	—	—	—	—
Osaka	42.7	348	6 19	-117	—	—	—	11.9
Zi-ka-wei	44.3	331	e 8 22	-6	e 14 57	-9	—	—
Mizusawa	N. 46.3	356	8 43	+1	—	—	—	—
Honolulu	62.6	62	e 15 13	?	18 1	-55	26.9	38.2
Helwan	E. 114.0	300	26 49	?S	(26 49)	-73	—	—
Hamburg	121.0	331	e 20 27	?PR ₁	—	—	—	32.2
De Bilt	124.2	331	e 21 7	?PR ₁	e 31 24	?	e 59.2	64.1
Strasbourg	125.0	327	e 17 53	+107	—	—	—	—
Uccle	125.4	331	e 21 1	?PR ₁	—	—	e 63.2	—
Toronto	126.6	39	—	—	—	—	73.9	—
La Paz	139.5	126	i 19 18	[-20]	23 12	?PR ₁	24.4	25.8

Additional readings: Riverview gives also i = $+6m.40s.$ and $+12m.21s.$,
MZ = $+18.3m.$, MN = $+19.3m.$, $T_0 = 10h.51m.54s.$, Adelaide i = $+13m.13s.$,
e = $+16m.43s.$, Manila gives S as L, also S(?PR₁) = $+10m.44s.$, MN =
 $+13.2m.$, $T_0 = 10h.53m.43s.$, Mizusawa PE = $+8m.13s.$, Helwan PN =
 $+38m.7s.$ (?SR₁). De Bilt MN = $+67.5m.$

1920. Oct. 22d. 12h. 9m. 50s. Epicentre $21^{\circ}5S$, $72^{\circ}0W$.

A = $+0.288$, B = -0.885 , C = -0.366 ; D = -0.951 , E = -0.309 ;
G = -0.113 , H = $+0.348$, K = -0.930 .

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	m.	s.	m.	s.	m.	s.	m.	m.
La Paz	6.2	37	i 1 36	+1	2 43	-6	3.1	3.4
Balboa Heights	E. 31.4	346	6 36	-6	11 45	-13	—	12.5
	N. 31.4	346	6 35	-7	11 58	0	—	12.0
Vieques	E. 40.2	10	—	—	e 13 45	-25	e 17.1	17.9
	N. 40.2	10	—	—	e 12 57	?	16.9	17.0
Tacubaya	48.8	325	9 2	+3	16 14	+10	20.1	—
Cheltenham	E. 60.4	358	e 10 14	-1	e 18 28	0	—	—
	N. 60.4	358	i 10 12	-3	18 20	-8	e 29.8	—
Washington	60.6	357	10 15	-1	18 30	-1	29.5	—
Georgetown	Z. 60.6	357	i 9 56	-20	e 19 5	+34	e 32.1	—
Ithaca	64.1	358	10 43	+4	19 15	+1	e 31.4	—
Ann Arbor	E. 64.7	351	10 34	-9	19 4	-17	26.7	—
	N. 64.7	351	10 40	-3	19 16	-5	26.7	—
	64.7	351	10 40	-3	19 22	+1	26.7	—
Chicago	64.9	348	10 36	-8	19 20	-4	32.2	—
Tucson	E. 65.4	325	10 58	+11	19 46	+16	—	—
Toronto	65.5	355	—	—	i 19 40	+9	e 31.9	49.9
Ottawa	67.0	358	i 10 56	-2	i 19 45	-5	e 27.7	—
Azores	73.5	37	21 16	?S	(21 16)	+8	—	23.4
Berkeley	Z. 75.9	322	e 11 59	+5	(e 21 47)	+11	e 21.8	—
	75.9	322	e 11 58	+4	(e 21 59)	+23	e 22.0	—
Cape Town	78.6	122	21 15	?S	(21 15)	-52	—	21.4
	78.6	122	21 33	?S	(21 33)	-34	—	21.7
Victoria	83.6	329	—	—	23 10	+5	e 38.3	47.8
San Fernando	84.8	48	13 4	+17	(22 28)	-49	22.5	58.5
Rio Tinto	85.2	46	25 10	?S	(25 10)	+109	—	28.2
Coimbra	85.4	43	12 26	-24	i 22 42	-41	39.6	50.6

Continued on next page.

	Δ °	Az. °	P. m. s.	O—C. s.	S. m. s.	O—C. s.	L. m.	M. m.
Tortosa	91.6	46	13 10	-15	23 14	-77	35.2	62.0
Algiers	91.6	50	e 13 7	-18	23 15	-76	34.2	43.2
Barcelona	93.0	46	e 14 18	-46	23 27	-78	e 36.3	48.5
Honolulu	94.3	291	e 13 4	-36	24 10	-49	41.8	53.5
Bidston	95.4	35	23 46	?s	(23 46)	-84	—	—
Oxford	95.6	36	—	—	i 23 42	-90	38.2	50.9
Kew	96.0	36	—	—	—	—	—	57.2
Paris	96.4	40	—	—	i 23 46	-94	45.2	46.2
Edinburgh	96.6	31	23 48	?s	31 10	-?	39.2	53.9
Besançon	97.8	43	—	—	23 16	-138	45.2	—
Moncalieri	98.1	45	e 11 19	?	23 34	-123	34.2	42.4
Uccle	98.3	39	13 29	-33	i 24 0	-99	41.2	52.2
De Bilt	99.3	38	e 14 10	-3	e 24 50	-59	e 48.2	50.3
Strasbourg	99.5	41	e 12 35	-93	e 24 5	-106	e 41.2	64.2
Florence	100.0	47	19 10	?PR ₁	—	—	—	25.2
Rocca di Papa	100.3	49	i 13 40	-32	i 24 4	-115	e 27.5	—
Padova	101.0	45	20 10	?PR ₁	24 21	-104	—	—
Hamburg	102.5	37	e 13 48	-35	i 24 23	-117	e 43.2	51.2
Vienna	104.8	43	14 58	+25	i 24 30	-130	e 49.3	55.7
Riverview	111.1	217	e 19 55	?PR ₁	e 28 55	+77	e 47.4	49.1
Helwan	E. 111.6	65	—	—	—	—	—	68.1
Mizusawa	146.7	309	19 52	[- 1]	—	—	—	—
Kodaikanal	148.6	106	20 58	?	—	—	80.7	82.8
Colombo	149.1	113	17 10	?	—	—	—	45.2
Simla	150.8	64	—	—	e 35 52	?	—	42.8
Batavia	152.3	178	19 55	[- 4]	—	—	—	21.2
Osaka	152.5	305	22 33	?PR ₁	—	—	—	28.0
Manila	165.9	243	e 20 8	[- 4]	—	—	—	87.2
Taihoku	167.1	288	e 25 0	?PR ₁	—	—	—	—

Additional readings: Tacubaya gives PZ = +9m.3s., LN = +20.9m., LZ = +22.4m. Chicago L = +42.2m. Tucson iPN = +10m.57s. Toronto i = +20m.16s., eL = +45.6m. Ottawa iN = +15m.40s., iE = +20m.30s., iEN = +21m.32s., L = +50.2m., T₀ = 12h.9m.51s. San Fernando MN = +25.0m. Coimbra iN = +23m.34s., iE = +23m.42s., MN = +49.9m., T₀ = 12h.9m.58s. Barcelona MN = +43.5m. Bidston S = +30m.58s. Edinburgh PR₁ = +25m.55s., SR₁ = +35m.22s. Uccle SR₁ = +31m.19s. De Bilt eN = +17m.52s., eE = +18m.10s., e = +24m.6s. Strasbourg MN = +63.2m. Rocca di Papa PR₁ = +17m.34s., eLN = +39.7m. Hamburg iSN = 24m.24s., e = +32m.16s., MN = -47.2m., MZ = +65.2m. Vienna iSN = +24m.31s., iE = -27m.13s., SR₂ = +32m.51s. Helwan MN = +73.6m. Mizusawa PN = +19m.58s.

Oct. 22d. 21h. 35m. 3s. Epicentre 46°-0N. 9°-0E. (as on 1920 April 1d.).

A = +.686, B = +.109, C = +.719.

	Δ °	P. m. s.	O—C. s.	S. m. s.	O—C. s.	L. m.	M. m.
Chur	0.9	i 0 9	- 5	i 0 31	+ 6	—	—
Zurich	E. 1.4	e 0 18	- 3	i 0 44	+ 5	—	0.8
	N. 1.4	e 0 21	0	i 0 45	+ 6	—	0.8
Strasbourg	2.7	i 1 10	+28	(1 10)	- 4	—	—
Vienna	5.4	e 1 23	0	—	—	i 1.5	1.6

Additional readings: Vienna gives iP = +1m.28s. Munchen eP = +0s., iS = +8s.

Oct. 22d. Readings also at 2h. (Nagasaki and San Fernando), 3h. (Zi-ka-wei, Manila, and Taihoku), 4h. (Helwan and De Bilt), 12h. (Rocca di Papa), 14h. (near Tokyo, Mizusawa, and Osaka), 20h. (La Paz, Manila, near Osaka, and Mizusawa).

Oct. 23d. Readings at 0h. (San Fernando), 3h. (Rocca di Papa), 4h. (Riverview), 5h. (La Paz (3)), 6h. (De Bilt), 7h. (Manila), 10h. (La Paz), 13h. (Taihoku and Manila), 16h. (La Paz), 17h. (Apia).

Oct. 24d. 1h. 38m. 25s. Epicentre $16^{\circ}2'S$, $165^{\circ}4'E$.

$$A = -.929, B = +.242, C = -.279; \quad D = +.252, E = +.968; \\ G = +.270, H = -.070, K = -.960.$$

This epicentre was deduced by comparison with $15^{\circ}0'S$, $165^{\circ}0'E$. of 1919 Aug. 31d.; the material is, however, somewhat meagre, and the departure from the former epicentre may not be real.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	21.8	213	c 5 4	+ 1	i 9 3	+ 2	—	13.6
Sydney	21.8	213	5 11	+ 8	(9 29)	+28	9.5	10.9
Apia	22.2	87	4 27	-40	(9 35)	+26	9.6	—
Adelaide	30.4	227	e 6 35	+ 3	e 11 29	-12	i 16.1	20.9
Perth	47.4	241	6 35	-135	—	—	—	—
Honolulu	51.9	45	e 9 35	+16	16 5	-38	21.0	22.8
Manila	53.6	304	e 14 30	?PR ₁	—	—	—	—
Batavia	58.1	273	e 10 0	0	18 1	+ 1	—	—
Zi-ka-wei	63.5	320	e 10 37	+ 2	—	—	—	—
Calcutta	E. 84.7	295	13 29	+43	(22 47)	-29	22.8	—
Chicago	113.3	51	—	—	—	—	e 57.8	—
La Paz	117.9	120	e 19 10	[+23]	—	—	60.6	67.9
Toronto	119.2	49	—	—	—	—	55.7	64.6
Ottawa	121.6	46	—	—	—	—	e 64.2	—
Helwan	135.9	296	24 35	?PR ₁	—	—	—	—
Vienna	Z. 139.2	330	i 19 24	[-14]	i 22 24	?PR ₁	—	—
De Bilt	140.9	340	(e 23 13)	—	—	—	—	—
Bidston	141.7	349	23 17	?PR ₁	—	—	—	—
Uccle	142.2	340	e 20 11	[+28]	—	—	e 47.6	—
Strasbourg	E. 142.8	335	e 19 43	[- 2]	—	—	e 42.6	—
Padova	143.4	328	19 48	[+ 2]	—	—	—	—
Pompeii	144.8	320	19 25	[-23]	20 15	?	—	—
Rocca di Papa	145.3	322	19 41	[- 8]	—	—	—	20.7
Moncalieri	145.6	331	e 19 19	[-30]	—	—	20.4	—
San Fernando	158.4	341	30 5	?	—	—	—	—

Additional readings: Riverview gives also $iPR_1 = +5m.40s.$, $PS = +9m.13s.$, and $+9m.30s.$, $SR_1 = +10m.23s.$ and $+10m.30s.$, $MN = +17.5m.$, $T_1 = 1h.38m.29s.$, Apia $PR_1 = +4m.53s.$, $i = +6m.35s.$, Adelaide $i = +7m.47s.$, $i = +14m.29s.$, $+16m.5s.$ (taken as L), and $+16m.17s.$, $e = +19m.17s.$, Chicago L = $+60.1m.$, Toronto $eL = +63.8m.$ and $+80.0m.$, Vienna $iN = +23m.49s.$ and $+28m.59s.$, De Bilt gives a single reading PR_1 , Strasbourg $ePVN = +19m.26s.$, Rocca di Papa $PR_1 = +20m.29s.$

Oct. 24d. Readings also at 3h. (Rio Tinto), 8h. (near Manila), 10h. (San Fernando), 11h. (Helwan), 12h. (near Mizusawa and Tokyo), 16h. (Taihoku (3) and Zi-ka-wei), 17h. (De Bilt), 22h. (Taihoku).

Oct. 25d. Readings at 2h. (La Paz), 5h. (Algiers), 6h. (near La Paz), 8h. (La Paz, Manila, Batavia, and Riverview), 12h. (near Tokyo), 13h. (Riverview), 20h. and 22h. (near La Paz), 23h. (San Fernando).

Oct. 26d. 0h. 3m. 2s. Epicentre $40^{\circ}0'N$, $20^{\circ}0'E$. (as on Oct. 21d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Athens	3.6	123	e 1 0	+ 4	1 38	- 1	1.7	2.3
Strasbourg	12.2	318	e 3 6	+ 4	—	—	e 9.0	—
Helwan	13.7	134	8 58	?L	—	—	(9.0)	—
Uccle	15.3	320	e 3 37	- 6	—	—	e 10.5	—
De Bilt	15.8	325	—	—	—	—	e 10.5	11.0

Athens gives $MN = +2.0m.$, all its readings having been increased by one minute.

Oct. 26d. 19h. 4m. 20s. Epicentre $19^{\circ}4'N$. $122^{\circ}2'W$.

A = -0.502, B = -0.798, C = +0.332; D = -0.846, E = +0.533;
 G = -0.177, H = -0.281, K = -0.943.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tacubaya	21.5	86	4 24	-35	—	—	6.3	6.8
Victoria	29.0	358	26 9	?	—	—	27.6	29.1
Toronto	43.1	45	—	—	—	—	21.5	—
Cheltenham N.	43.5	53	15 0	18	(15 0)	-5	e 22.2	23.9
La Paz	64.1	120	e 10 39	0	19 14	0	30.2	32.3
Edinburgh	88.9	29	—	—	—	—	—	49.7
De Bilt	95.1	29	—	—	—	e	45.7	—
Helwan	124.5	28	79 40	1L	—	—	(79.7)	—

Additional readings and notes: Tacubaya gives also MN = -0.6m. Victoria perhaps registers a different shock. La Paz iP = +20m.19s., T₀ = 19h.4m.25s.

Oct. 26d. Readings also at 1h. (Tacubaya), 3h. (Batavia), 4h. (La Paz), 9h. (Apia), 11h. (Tacubaya), 15h. (Zi-ka-wei), 23h. (La Paz and San Fernando).

Oct. 27d. 11h. 44m. 21s. Epicentre $19^{\circ}0'N$. $70^{\circ}0'W$. (as on 1920 Jan. 26d.).

A = +0.323, B = -0.889, C = +0.326; D = -0.940, E = -0.342;
 G = +0.111, H = -0.306, K = -0.946.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Port au Prince	2.1	260	i 0 22	-11	0 45	-13	1.2	1.7
Vieques	4.4	99	i 1 0	-8	—	—	1.5	2.0
Washington	20.8	341	4 23	-28	8 23	-17	—	—
Chicago	27.2	330	—	—	11 4	+19	14.1	—
La Paz	35.6	177	i 7 26	-8	—	—	21.2	25.4
Rio Tinto	57.7	57	36 39	1L	—	—	(36.6)	40.6
Granada	60.1	57	i 10 16	+3	i 19 10	+46	—	—
Bidston	61.2	39	—	—	—	—	27.4	—
Edinburgh	61.4	36	—	—	—	—	40.6	—
Tortosa	63.2	53	—	—	—	e	29.6	41.0
De Bilt	66.1	41	—	—	—	e	33.6	38.4
Zante	77.5	54	—	—	20 39	-76	—	—
Helwan	90.0	58	40 39	1L	(31 39)	1SR ₁	(40.6)	—

Additional readings and notes: Port au Prince readings have been increased by 1h.2m. Vieques MN = +1.8m. De Bilt MN = +38.6m. Helwan gives its two readings as PE and PN respectively.

Oct. 27d. Readings also at 3h. (Zante), 4h. (Taihoku and Batavia), 5h. (Manila), 10h. (Port au Prince), 11h. (Vieques and Washington), 13h. (Simla).

Oct. 28d. 7h. 23m. 40s. Epicentre $51^{\circ}0'N$. $179^{\circ}5'W$. (as on 1918 Sept. 30d.).

A = -0.629, B = -0.005, C = +0.777; D = -0.009, E = +1.000;
 G = -0.777, H = -0.007, K = -0.629.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Ootomari	24.9	275	4 23	-74	—	—	—	—
Tokyo	33.1	260	e 7 25	+28	—	—	—	—
Honolulu	34.1	142	e 8 20	1PR ₁	—	—	14.5	15.9
Victoria	35.6	73	—	—	(12 51)	-13	12.8	20.7
Berkeley	41.7	86	—	—	—	e	22.8	—
Zi-ka-wei	47.2	270	8 42	-6	e 15 32	-12	—	—
Taihoku	51.4	265	—	—	—	e	21.3	—

Continued on next page.

	Δ	Az.	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Manila	59.7	259	e 10 9	- 1	—	—	—	—
Chicago	60.0	60	10 10	- 2	18 15	- 8	28.6	—
Ann Arbor	61.6	57	—	—	—	—	33.0	—
Toronto	62.8	53	—	—	e 20 8	+70	e 35.5	37.4
Ottawa	63.4	50	—	—	e 19 20	+14	e 29.5	—
Ithaca	65.2	52	—	—	—	—	e 36.8	—
Georgetown	67.5	56	—	—	—	—	44.8	—
Washington	67.5	56	8 7	-174	17 5	-171	e 36.3	—
Edinburgh	73.0	3	—	—	—	—	40.3	—
Simla	73.9	300	—	—	—	—	e 37.9	—
Hamburg	75.1	355	e 11 52	- 2	e 21 31	- 4	e 38.3	49.3
De Bilt	76.8	357	11 58	- 2	21 49	- 2	e 40.3	50.1
Uccle	78.1	358	e 12 4	- 4	e 22 2	+ 1	—	—
Paris	80.2	359	—	—	e 22 26	+ 1	47.3	51.3
Strasbourg	80.2	356	e 12 19	- 1	22 26	+ 1	48.3	—
Moncalieri	83.8	355	e 10 8	-153	23 4	- 3	37.0	53.3
Rocca di Papa	86.6	351	e 12 56	- 1	i 23 29	- 8	e 43.7	59.8
Tortosa	88.2	0	—	—	—	—	e 42.3	59.1
Riverview	88.7	204	—	—	e 23 47	-13	e 45.1	47.8
Kodaikanal	90.1	286	55 32	?L	—	—	61.7	67.1
Colombo	91.2	282	55 20	?L	—	—	(55.3)	—
San Fernando	92.4	5	—	—	—	—	—	70.3
Helwan	94.7	334	19 20	?PR ₁	(25 20)	+17	—	—
La Paz	116.2	84	e 19 51	?PR ₁	33 42	?	70.5	74.2

Additional readings: Berkeley gives eN = +18m.21s., eZ = +22m.4s. Chicago L = +34.3m. and +39.3m., T₀ = 7h.23m.49s. Toronto eL = +53.9m. Ottawa L = -33.1m., L = -39.1m., and +55.3m. Simla gives its readings as on 27d. De Bilt eSR₁E = +27m.1s., eSR₁N = +27m.7s., MN = +54.7m., T₀ = 7h.23m.45s. Uccle SR₁ = +27m.44s., T₀ = 7h.23m.44s. Rocca di Papa eN = +15m.44s. Riverview MN = +52.3m. Helwan readings are given as PE and PN respectively.

Oct. 28d. 12h. 50m. 6s. Epicentre 27° 0S. 74° 4W.

A = -.240, B = -.858, C = -.454; D = -.963, E = -.269;
G = -.122, H = -.437, K = -.891.

	Δ	Az.	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
La Paz	12.0	30	i 2 59	0	i 5 19	0	6.1	9.2
Balboa Heights	36.3	352	e 7 14	-10	13 19	+ 5	—	—
Vieques	46.0	11	e 8 35	- 5	e 15 2	-26	—	19.6
Cheltenham	65.8	359	i 10 49	- 1	19 57	+22	—	—
Georgetown	65.9	358	e 9 54	-56	i 20 14	+38	e 32.0	—
	65.9	358	i 9 49	-61	e 20 5	+29	e 32.0	—
Washington	65.9	358	i 9 53	-57	18 42	-54	e 32.9	—
Tucson	68.7	327	e 11 16	+ 7	20 29	+19	e 34.8	—
Ithaca	69.5	359	11 16	+ 2	e 20 16	- 4	e 36.4	—
Chicago	69.8	350	11 12	- 4	20 39	+15	35.5	—
Ann Arbor	69.8	354	11 18	+ 2	20 24	0	35.7	—
	69.8	354	11 0	-16	20 30	+ 6	36.1	—
	69.8	354	—	—	20 18	- 6	36.7	—
Toronto	70.8	356	11 6	-16	i 20 54	+18	e 35.4	—
Northfield	71.8	2	e 11 44	+16	—	—	—	—
Ottawa	72.4	0	11 30	- 2	20 54	- 1	e 35.0	—
Capetown	77.5	122	3 31	?	21 49	- 6	42.6	48.5
	77.5	122	11 42	-22	21 9	-46	—	21.8
Lick	78.2	324	e 12 14	+ 6	—	—	—	—
Berkeley	78.9	324	12 17	+ 5	—	—	e 39.4	—
Victoria	87.2	330	41 33	?L	—	—	45.5	49.9
San Fernando	90.2	49	—	—	(23 24)	-52	23.4	61.4
Rio Tinto	90.6	48	25 54	?S	(25 54)	+94	—	65.9
Coimbra	90.9	45	12 51	-30	23 13	-70	e 41.6	47.3
Granada	92.3	50	i 13 28	- 1	i 23 35	-63	—	—
Honolulu	94.2	292	e 13 6	-33	23 48	-70	44.9	49.3
Algiers	96.8	52	e 13 43	-10	23 49	-95	45.9	49.9
Tortosa	96.9	47	13 41	-13	23 54	-91	36.4	49.8
Barcelona	98.3	48	e 17 6	?PR ₁	i 23 56	-103	e 44.9	52.5

Continued on next page.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$		m. s.	s.	m. s.	s.	m.	m.
Bidston	101.2	36	16 24	?	23 54	-133	—	—
Oxford	101.3	38	—	—	24 15	-113	44.4	59.6
Kew	101.7	38	23 54	?S	(23 54)	-138	—	60.9
Paris	102.1	41	e 14 9	-12	i 25 16	-60	45.9	54.9
Edinburgh	102.4	33	24 20	?S	33 4	?SR ₁	45.9	59.5
Besançon	103.4	44	13 45	-42	25 33?	-55	51.9	—
Moncalieri	103.5	46	e 14 24	-4	24 23	-126	35.6	65.8
Uccle	104.0	40	e 13 54	-36	24 31	-122	e 41.9	55.9
Strasbourg	105.0	43	e 14 11	-23	—	—	e 49.9	55.9
De Bilt	105.0	40	—	—	e 25 43	-59	—	74.8
Melbourne	105.4	211	—	—	—	—	e 52.3	56.9
Florence	105.4	49	14 54	+18	—	—	—	32.9
Riverview	105.4	218	—	—	—	—	e 49.2	49.8
Rocca di Papa	N.	105.6	50	i 18 18	?PR ₁	i 24 42	-126	e 50.3
Padova	—	106.4	46	18 21	?PR ₁	25 17	-99	—
Pompeii	—	106.5	51	18 41	?PR ₁	—	—	—
Hamburg	—	108.2	39	e 18 9	?PR ₁	i 24 51	-141	e 50.9
Vienna	—	110.3	45	18 30	?PR ₁	27 18	-13	e 48.9
Athens	—	112.2	58	e 19 4	?PR ₁	e 31 24	?SR ₁	51.9
Mauritius	E.	114.0	131	44 36	?L	—	—	(44.6)
—	N.	114.0	131	45 36	?L	—	—	(45.6)
Helwan	E.	115.8	70	19 42	?PR ₁	—	—	74.3
—	N.	115.8	70	21 0	?	—	—	73.3
Perth	—	120.3	190	—	—	34 54	?SR ₁	—
Batavia	—	146.8	182	i 19 44	[- 7]	—	e 72.4	—
Mizusawa	E.	148.1	301	19 48	[- 5]	—	—	—
Colombo	—	148.3	128	18 54	?	—	—	87.9
Kodaikanal	—	148.6	119	20 24	[+30]	—	33.2	36.3
Bombay	—	148.8	99	69 37	?L	—	(69.6)	77.3
Tokyo	—	149.9	296	e 20 6	[+10]	—	—	—
Manila	—	161.1	232	e 20 11	[+ 2]	—	—	—
Zi-ka-wei	—	165.6	291	e 21 14	[+62]	—	—	—
Taihoku	—	165.6	266	—	—	e 30 42	?	—

Additional readings: Vieques gives also eN = +10m.16s., iE = +18m.42s. Cheltenham ePN = +10m.54s., SE = +20m.12s. Tucson PN = +11m.23s. Ithaca PR₁ = +13m.44s. Chicago L = +69.9m. and +78.9m. Toronto e = +10m.30s., i = +23m.48s., iS = +25m.48s., iSR₂ = +29m.36s. Ottawa PR₁N = +14m.39s., PR₂N = +16m.15s., iN = +21m.18s., and +22m.6s., SR₁N = +26m.8s., SR₂N = +29m.4s., L = +36.6m. and +37.9m., T₀ = 12h.50m.11s. Lick eE = +12m.13s., eV = +12m.12s. Berkeley ePV = +12m.16s., eLN = +38.8m., eLV = +39.3m. San Fernando MN = +57.4m. Coimbra iN₁ = +23m.43s., iN₂ = +24m.14s., T₀ = 12h.50m.33s. Edinburgh PR₁ = +27m.8s. Moncalieri MN = +57.6m. Uccle MN +65.2m., T₀ = 12h.51m.18s. De Bilt ePR₁ = +18m.43s., e = +24m.35s., MN = +78.7m. Riverview ePR₁? = +18m.41s., ePS? = +28m.5s., e = +44m.40s., MN = +77.0m. Rocca di Papa eLN = +32.8m. Athens MN = +65.2m. Mizusawa readings at N +19m.54s. and E +20m.18s.

Oct. 28d. Readings also at 1h. (La Paz), 8h. (Bidston and Pompeii), 10h. (Zi-ka-wei), 11h. (Nagasaki, Manila, Taihoku, and Zi-ka-wei), 12h. (Uccle, Paris, Bidston, Hamburg, Strasbourg, De Bilt, and Helwan), 13h. (Riverview and Victoria), 14h. (Kodaikanal), 16h. (Batavia and La Paz).

Oct. 29d. Readings at 0h. (La Paz (2)), 4h. (Helwan, De Bilt, and near Athens), 5h. (Manila), 6h. (San Fernando), 12h. (Apia), 18h. (La Paz).

Oct. 30d. Readings at 6h. (Florence), 16h. (Apia), 21h. (San Fernando), 22h. (near Tacubaya), 23h. (near Tokyo).

Oct. 31d. Readings at 0h. and 6h. (San Fernando), 10h. (Helwan), 13h. (near Tacubaya), 18h. (Apia).

Nov. 1d. 16h. 53m. 36s. Epicentre S 08. 146°5E. (as on 1918 July 6d.).

A = -·826, B = +·547, C = -·139 ; D = +·552, E = +·834 ;

G = +·116, H = -·077, K = -·990.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	26·2	171	e 5 58	+ 8	i 10 37	+11	e 13·1	16·6
Sydney	26·2	171	8 42	+172	12 54	+148	15·4	16·6
Adelaide	27·9	194	—	—	—	—	18·4	20·9
Melbourne	29·9	183	—	—	—	—	17·7	22·4
Manila	34·0	312	e 7 9	+ 4	—	—	—	—
Perth	37·2	226	9 24	?PR ₁	—	—	—	—
Zi-ka-wei	45·9	330	e 8 26	-13	e 15 6	-21	—	—
Honolulu	61·8	61	—	—	e 17 36	-70	28·0	39·6
Helwan	115·7	299	71 24	?L	—	—	(71·4)	—
Chicago	121·7	45	—	—	—	—	e 62·2	—
De Bilt	125·8	332	—	—	—	—	e 64·4	72·9
Paris	129·2	330	—	—	—	—	72·4	—
La Paz	137·9	126	19 28	[- 8]	i 23 14	?PR ₁	—	—

Additional readings : Riverview gives also iS = +12m.30s. and MN = +15·4m.
Helwan PN = +70m.24s. De Bilt MN = +70·7m.

Nov. 1d. Readings also at 2h. (Colombo), 4h. (San Fernando), 8h. (Apia, Batavia, Zi-ka-wei, and Manila), 9h. (Helwan), 11h. (near Mizusawa), 14h. and 15h. (Taihoku), 21h. (San Fernando).

Nov. 2d. Readings at 2h. (Apia and Denver), 6h. (Colombo), 11h. (La Paz), 12h. (Cape Town), 19h. (La Paz), 21h. (La Paz and San Fernando), 22h. (Helwan).

Nov. 3d. 15h. 35m. 36s. Epicentre 6°·5N. 126°·0E. (as on 1920 May 7d.).

A = -·584, B = +·804, C = +·113 ; D = +·809, E = +·588 ;

G = -·066, H = +·092, K = -·994.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	9·5	330	e 2 24	+ 1	4 22	+ 6	4·8	8·5
Taihoku	19·0	347	4 41	+12	—	—	7·4	—
Batavia	22·9	237	4 57	-19	i 9 4	-19	17·2	—
Zi-ka-wei	25·0	351	e 5 35	- 3	e 7 59	?PR ₁	i 12·5	—
Perth	39·6	194	8 24	+33	—	—	—	—
Colombo	45·9	273	16 24	?S	(16 24)	+57	25·4	27·4
Kodaikanal	48·2	278	19 54	?SR ₁	—	—	32·2	33·2
Helwan	90·8	300	25 24	?S	(25 24)	+62	—	—
Hamburg	99·7	327	—	—	—	—	e 51·4	66·4
Strasbourg	102·4	321	—	—	—	—	e 56·4	—
De Bilt	102·9	327	—	—	e 27 0	+37	e 52·4	59·9
Uccle	104·0	326	—	—	e 35 21	?SR ₁	e 51·4	—
Edinburgh	105·0	333	—	—	—	—	—	69·4
Stonyhurst	105·9	331	42 6	?L	—	—	62·8	65·4
Paris	106·1	324	—	—	—	—	e 57·5	—
Kew	106·4	328	—	—	—	—	—	67·4
Oxford	106·4	328	—	—	—	—	—	62·9
La Paz	162·9	127	20 39	[+29]	—	—	48·7	—

Additional readings and notes : The P's entered for Taihoku and Zi-ka-wei are given originally as e's. Batavia gives i = +7m.24s. and +11m.20s.
Helwan PN = 24m.24s. Hamburg MN = 62·4m. De Bilt MN = 58·9m.

Nov. 3d. Readings also at 0h. (Lick), 2h. (Colombo), 7h. and 10h. (La Paz), 12h. (Helwan), 16h. (Riverview), 22h. (La Paz).

Nov. 4d. 2h. 11m. 30s. Epicentre $19^{\circ}0'N$. $70^{\circ}0'W$. (as on 1920 Oct. 27d.).

A = +.323, B = -.889, C = +.326; D = -.940, E = -.342;
G = -.111, H = -.306, K = -.946.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Port au Prince	2.1	260	i 0 46	+13	1 4	- 6	1.3	1.6
Vieques	4.4	99	e 1 8	0	—	—	—	1.9
Georgetown	20.8	344	e 4 30	-21	8 35	- 5	16.7	—
Washington	20.8	344	3 40	?	7 30	-70	e 10.5	—
Ithaca	24.0	348	i 5 20	- 8	9 20	-24	—	—
Northfield	25.3	356	—	—	(e 9 50)	-19	e 9.8	—
Toronto	25.9	344	—	—	(10 48)	+28	16.1	—
Ann Arbor	26.0	336	10 48	?S	(10 48)	+26	—	—
Ottawa	26.8	351	—	—	e 10 10	-27	—	—
Chicago	27.2	330	6 17	17	9 53	-52	15.0	—
La Paz	35.6	177	i 7 3	-15	13 3	- 1	18.2	20.8
San Fernando	58.0	58	18 30	?S	(18 30)	+31	—	—
Stonyhurst	61.6	38	e 30 0	?L	—	—	(e 30.0)	39.5
Uccle	65.6	42	e 10 48	- 1	—	—	e 26.5	—
De Bilt	66.1	41	—	—	e 19 24	-14	e 29.5	42.2
Helwan	90.0	58	52 30	?L	—	—	(52.5)	—

Additional readings: Port au Prince gives also SNW = +1m.5s. Vieques eN = +1m.36s., MN = +2.1m. Ithaca e = +5m.10s., T_0 = 2h.11m.49s. Toronto records two L's. Ann Arbor PN = +11m.0s. Chicago L? = +11.7m., T_0 = 2h.13m.18s. La Paz i = +12m.23s., T_0 = 2h.11m.0s. De Bilt eLN = +27.5m. Helwan PN = +48m.30s.

Nov. 4d. Readings also at 2h. and 5h. (La Paz), 13h. (near Tokyo), 18h. (near Athens and near Batavia), 22h. (near Manila).

Nov. 5d. Readings at 0h. (San Fernando), 3h. (near Manila and near Tacubaya), 4h. (near Tokyo and Mizusawa), 6h. (La Paz and near Batavia), 7h. (near Tacubaya), 8h. (La Paz), 14h. (Taihoku), 15h. (Hokoto, Taihoku, Zi-ka-wei, and Zante), 23h. (La Paz).

Nov. 6d. 10h. 44m. 30s. Epicentre $19^{\circ}0'N$. $70^{\circ}0'W$. (as on 1920 Nov. 4d.).

A = +.323, B = -.889, C = +.326; D = -.940, E = -.342;
G = +.111, H = -.306, K = -.946.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Port au Prince	2.1	260	e 0 19	-14	0 40	-18	1.2	2.2
Vieques E.	4.4	99	0 54	-14	—	—	—	1.7
N.	4.4	99	0 56	-12	—	—	1.4	1.6
Georgetown E.	20.8	344	—	—	e 9 10	-30	e 14.9	—
N.	20.8	344	—	—	e 9 14	-34	e 15.2	—
Washington	20.8	344	4 14	-37	8 18	-22	e 12.5	—
Toronto	25.9	344	—	—	e 10 24	+ 4	13.9	17.8
Ann Arbor	26.0	336	—	—	—	—	9.8	—
Ottawa E.	26.8	351	—	—	e 11 17	+40	e 15.8	—
Chicago	27.2	330	6 45	+45	11 26	+41	14.3	—
La Paz	35.6	177	7 21	+ 3	—	—	20.0	22.9
Stonyhurst	61.6	38	30 0	?L	—	—	(30.0)	37.0
De Bilt E.	66.1	41	—	—	—	—	e 33.5	44.8
N.	66.1	41	—	—	e 19 42	+ 4	e 28.5	29.6
Hamburg	69.0	39	—	—	—	—	e 38.5	—
Helwan	90.0	58	62 30	?	—	—	—	—

Additional readings and notes: Port au Prince readings have been diminished by 3m., also MNW = +1.8m. Washington L = +14.5m. Toronto eL = +16.1m. Ottawa LE = +24.0m. Chicago L = +17.2m. Helwan PN = +58m.30s.

Nov. 6d. 21h. 11m. 12s. Epicentre 13°58'. 162°0E.

A = -·925, B = +·300, C = -·233; D = +·309, E = +·951;
G = +·222, H = -·072, K = -·972.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Riverview	22·6	204	e 5 11	- 1	e 9 15	- 2	e 10·7	12·2
Sydney	22·6	204	4 54	-18	—	—	9·3	12·2
Melbourne	28·7	209	—	—	—	—	14·9	17·8
Adelaide	29·8	220	—	—	i 10 48	-43	e 16·6	19·8
Christchurch	31·4	165	11 54	?S	(11 54)	- 4	13·4	14·6
Honolulu	52·4	49	—	—	—	—	e 22·3	31·8
Chicago	114·1	50	—	—	—	—	e 59·8	—
Helwan	131·8	298	92 48	?	—	—	—	—
De Bilt	E. 137·2	339	—	—	—	—	e 77·8	80·3
Uccle	138·5	339	—	—	—	—	e 78·8	—
Rio Tinto	153·7	339	89 48	?L	—	—	(89·8)	103·8
San Fernando	154·7	337	81 48	?L	—	—	(81·8)	—

Additional readings: Riverview gives also PS = -9m.28s., MN = +12·9m.
Adelaide e = +17m.36s. Chicago L = +65·3m. Helwan PN =
-86m.48s. De Bilt eLN = +75·8m., MN = -79·1m.

Nov. 6d. Readings also at 0h. (San Fernando), 1h. (near Mizusawa), 6h. (Tortosa),
sh. (Zi-ka-wei), 9h. (Cape Town), 18h., 21h., and 23h. (near La Paz).

Nov. 7d. Readings at sh. (Taihoku), 11h. (Rocca di Papa).

Nov. 8d. 17h. 37m. 25s. Epicentre 35°0N. 143°0E. (as on 1919 Aug. 3d.).

A = -·651, B = +·493, C = +·574; D = +·602, E = +·799;
G = -·458, H = +·345, K = -·819.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Tokyo	2·8	285	0 44	0	(1 11)	- 6	1·2	1·2
Mizusawa	E. 4·4	340	1 10	- 2	2 4	+ 3	—	—
	N. 4·4	340	1 9	- 1	2 2	+ 1	—	—
Osaka	6·2	270	1 54	+19	—	—	3·2	4·1
Kobe	6·4	266	0 35	?	—	—	—	—
Zi-ka-wei	18·4	266	e 4 46	+24	—	—	—	—
Hamburg	82·6	335	—	—	—	—	e 41·0	—
De Bilt	E. 85·4	336	—	—	—	—	e 42·6	52·0
	N. 85·4	336	—	—	—	—	e 44·6	53·6
Uccle	86·7	336	—	—	—	—	e 44·6	—
Strasbourg	87·4	331	—	—	—	—	47·6	—
Helwan	88·6	306	56 35	?L	—	—	(56·6)	—
Paris	89·1	335	—	—	—	—	52·6	—
Rocca di Papa	90·7	326	—	—	e 34 5	?	e 51·5	60·2
Tortosa	96·6	332	—	—	—	—	e 52·6	59·2
Rio Tinto	101·9	336	58 35	?L	—	—	(58·6)	62·6

Nagasaki ($\Delta = 11^{\circ}1$, Az. = 262°) gives P = 17h.32m.23s.

Nov. 8d. Readings also at 1h. (Taihoku and San Fernando), 2h. (La Paz), 9h.
(near Tokyo and Mizusawa), 15h. (near Osaka), 16h. (Rio Tinto and
Perth), 17h. (La Paz), 18h. (near Athens), 19h. (Ottawa), 22h. (San
Fernando).

Nov. 9d. Readings at 4h. (La Paz), 5h. (La Paz and near Batavia), 6h. (near
Athens), 10h. (Helwan), 18h. (La Paz), 20h. (San Fernando).

Nov. 10d. Readings at 1h. (Apia), 3h. (Taihoku), 6h. (La Paz), 7h. (Taihoku), 8h. (Apia), 13h. (La Paz), 19h. (near Tokyo), 21h. (San Fernando and near Nagasaki).

Nov. 11d. Readings at 11h. (Tokyo, Sydney, and Christchurch), 12h. (Helwan and De Bilt), 20h. (La Paz), 21h. (Helwan), 23h. (Helwan).

Nov. 12d. 5h. 41m. 48s. Epicentre $0^{\circ} 0' 28''$ W.

A = +.881, B = -.473, C = .000; D = -.473, E = -.881;
G = .000, H = .000, K = -1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.	
			m. s.	s.	m. s.	s.	m.	m.	
Azores	37.8	4	14 6	?S	(14 6)	+31	—	15.2	
San Fernando	41.8	27	—	—	—	—	22.4	30.2	
La Paz	42.7	244	i 8 16	0	14 44	0	20.4	24.2	
Rio Tinto	42.7	26	9 12	+56	—	—	—	29.2	
Granada	43.6	28	i 8 29	-6	i 14 59	-3	—	—	
Coimbra	44.1	22	8 15	-12	i 14 48	-15	20.5	22.5	
Algiers	46.8	35	8 36	-10	15 29	-9	22.2	27.2	
Tortosa	48.5	28	8 33	-24	15 48	-12	22.8	25.2	
Barcelona	49.7	30	i 8 56	-9	16 4	-11	22.6	26.5	
Moncalieri	55.2	30	i 9 37	-3	i 17 19	-5	27.1	30.2	
Cape Town	55.3	133	17 20	?S	(17 20)	-5	—	33.5	
Paris	55.6	25	e 9 43	0	i 17 27	-2	24.2	26.2	
Rocca di Papa	55.7	37	i 9 43	-1	e 17 30	0	e 27.5	30.7	
Besançon	55.8	28	9 44	-1	17 32	+1	28.2	—	
Florence	56.1	33	11 12	?PR ₁	—	—	—	36.2	
Pompeii	56.2	39	9 48	+1	—	—	—	—	
Oxford	56.5	20	9 43	-6	i 17 41	+1	23.5	30.0	
Kew	56.6	21	14 12	?PR ₁	—	—	—	41.2	
Zurich	57.2	29	e 9 54	+1	e 17 47	-2	—	—	
Bidston	57.4	20	8 32	-83	17 42	-9	—	—	
Padova	57.5	32	10 57	+61	18 50	+57	—	—	
Strasbourg	57.6	28	e 9 57	+1	i 17 53	-1	e 29.2	31.0	
Uccle	57.8	25	9 58	0	i 17 55	-1	e 27.2	29.8	
Stonyhurst	57.9	20	13 48	?	18 0	-2	24.5	33.5	
De Bilt	59.1	25	10 9	+3	18 17	-5	e 27.6	30.1	
	N.	59.1	25	+3	18 15	-3	e 27.6	30.6	
Georgetown	E.	59.2	318	—	e 15 39	?	27.6	—	
Washington		59.2	318	—	18 14	-1	—	—	
Edinburgh		59.5	17	—	18 18	+1	25.2	29.7	
Athens	E.	61.0	46	(i 10 22)	+3	i 10 22	?P	e 32.5	37.8
	N.	61.0	46	—	—	—	e 32.9	37.2	—
Vienna		61.7	31	i 10 26	+3	i 18 50	+6	e 29.9	35.0
Ottawa		61.7	325	—	e 18 45	+1	e 25.5	—	—
Hamburg		62.2	26	e 10 37	+11	e 18 53	-2	e 27.8	34.2
Toronto		63.0	321	—	e 20 12	+71	30.0	36.8	—
Helwan		63.9	58	—	—	—	—	40.1?	—
Ann Arbor		65.2	320	—	—	—	31.1	—	—
Chicago		67.7	317	—	21 12	+74	32.9	—	—
Victoria		93.4	320	24 22	?S	(24 22)	-27	43.5	50.9
Colombo		107.9	84	56 12	?L	—	—	(56.2)	71.2
Zi-ka-wei		137.6	40	—	—	—	e 69.8	—	—
Riverview		146.2	179	—	—	—	e 71.0	84.4	—

Additional readings and notes: San Fernando gives also MN = +25.6m., La Paz PR₁ = +10m.22s., SR₁ = +17m.52s., T₀ = 5h.41m.54s., Coimbra eLN = -18.2m., MN = -21.5m., T₀ = 5h.41m.46s., Moncalieri MN = +31.8m., Paris MN = +33.2m., Florence gives a P = 5h.0m.0s., Strasbourg MN = +32.8m., T₀ = 5h.41m.53s., Uccle iSR₁ = +24m.12s., MN = +35.2m., T₀ = 5h.41m.53s., De Bilt PR₁N = +13m.37s., PR₁E = +13m.44s., e = +25m.12s., T₀ = 5h.41m.54s., Athens readings have been increased by 1h., Ottawa L = +29.2m., Hamburg MN = -32.5m., Toronto eL = +32.1m., Ann Arbor LN = +31.0m., Chicago L = +38.2m., Victoria S = +31m.15s., Zi-ka-wei reading has been increased by 1h., Riverview e = +53m.24s. and +57m.18s., MN = +85.0m.

Nov. 12d. Readings also at 1h. (Perth), 7h. (near Tacubaya), 9h. (Edinburgh and Washington), 12h. (Tortosa), 14h. (La Paz and near Tacubaya), 16h. (Rio Tinto), 18h. (San Fernando), 19h. (Helwan), 21h. (La Paz), 22h. (near Tacubaya).

Nov. 13d. 10h. 30m. 34s. Epicentre $43^{\circ}8'N$. $11^{\circ}2'E$. (Florence) (as on 1920 Sept. 16d.).

A = +.708, B = +.140, C = +.692; D = +.194, E = -.981;
G = +.679, H = +.134, K = -.722.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Florence	0.0	—	0 13	+13	—	—	—	0.5
Padova	1.7	17	0 27	+ 1	0 44	- 4	—	—
Rocca di Papa	2.3	152	0 38	+ 2	—	—	—	1.6
Pompeii E.	3.9	142	1 58	?L	—	—	(2.0)	—
Vienna	5.7	37	e 1 26	- 2	i 2 26	-10	—	3.1

Padova readings have been decreased by 1m.

Nov. 13d. Readings also at 0h. (near Tacubaya), 1h. (La Paz, Denver, and near Balboa Heights), 2h. (La Paz), 5h. (La Paz and San Fernando), 6h. (near Tacubaya), 9h. (near Athens (2)), 11h. (Helwan), 18h. (Helwan and Simla), 19h. (San Fernando and Kodaikanal), 21h. (La Paz).

Nov. 14d. Readings at 3h. (Riverview, La Paz, and Helwan), 6h. (Calcutta), 7h. (San Fernando), 8h. (Helwan), 9h. (Apia), 13h. (near Athens), 15h. (La Paz), 20h. (San Fernando), 21h. (Florence), 23h. (near Batavia).

Nov. 15d. 9h. 20m. 43s. Epicentre $34^{\circ}5'N$. $25^{\circ}0'E$. (as on 1918 July 1d.).

A = +.747, B = +.348, C = +.566; D = +.423, E = -.906;
G = +.513, H = +.239, K = -.824.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Athens	3.6	344	i 0 57	+ 1	—	—	i 1.5	1.5
Pompeii	10.3	310	2 32	- 2	4 24	-13	—	6.3
Rocca di Papa N.	12.1	310	e 2 59	- 1	5 23	+ 2	—	7.7
Padova	14.8	321	4 31	+55	—	—	—	—
Vienna	15.2	337	e 3 59	+17	—	—	i 7.8	9.3
Zurich	17.8	321	i 4 11	- 4	i 7 30	- 6	—	—
Strasbourg	19.0	323	4 21	- 8	7 48	-14	10.3	—
Besançon	19.1	318	4 28	- 2	7 40	-24	—	—
Tortosa	20.3	295	4 44	- 1	—	—	5.4?	—
De Bilt	22.6	327	—	—	—	—	e 11.2	—
Granada	23.2	285	4 46	-33	9 30	+ 1	—	—

Vienna readings have been increased by 1h. before entry in the table.

Nov. 15d. Readings also at 0h. (La Paz), 3h. and 7h. (Taihoku), 9h. (Nagasaki and Helwan), 11h. (Taihoku, Helwan, near Zi-ka-wei (2), and near Osaka), 13h. (Florence), 18h. (Zi-ka-wei (2) and Taihoku), 19h. (Riverview and Melbourne), 21h. (Athens (2)).

Nov. 16d. 5h. 52m. 30s. Epicentre $24^{\circ}5'N$. $126^{\circ}5'E$. (as on 1918 Feb. 13d.).

A = -.541, B = +.731, C = +.415; D = +.804, E = +.595;
G = -.247, H = +.333, K = -.910.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Taihoku	4.6	280	1 23	+12	—	—	2.4	—
Zi-ka-wei	8.0	330	e 1 52	- 9	e 3 19	-18	—	4.0
Nagasaki	8.7	19	2 16	+ 4	—	—	—	—
Osaka	12.7	35	4 2	+53	—	—	—	12.1
Tokyo	15.9	43	e 4 4	+13	—	—	—	—
Colombo	47.9	257	—	—	—	—	—	23.5
De Bilt	87.9	328	—	—	—	—	e 48.5	—

Zi-ka-wei gives also MN = +1.1m.

1920. Nov. 16d. 8h. 30m. 52s. Epicentre 71° 8'N. 127° 0'W.

A = -188, B = -249, C = +950; D = -799, E = +602;

G = -572, H = -759, K = -312.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°		m. s.	s.	m. s.	s.	m.	m.
Sitka	15.2	198	e 3 40	- 2	e 6 48	+11	—	—
Saskatoon	22.0	143	e 4 16	+11	i 8 22	-43	10.1	—
Victoria	23.5	174	5 28	+ 5	9 21	-14	12.3	13.3
	23.5	174	5 28	+ 5	9 48	+13	13.4	16.4
Berkeley	34.0	175	e 6 56	- 9	e 12 27	-13	—	—
Lick	34.6	175	—	—	—	—	e 19.0	—
Ottawa	35.5	107	i 7 17	- 1	13 2	- 1	e 17.7	—
Chicago	35.6	127	8 23	-65	13 49	+45	17.0	21.6
Toronto	36.1	116	—	—	13 20	- 9	e 16.3	20.4
Ann Arbor	36.2	119	7 20	- 4	13 14	+ 1	19.2	20.3
	36.2	119	7 20	- 4	13 38	+25	19.5	—
Northfield	37.6	105	—	—	e 13 38	+ 6	—	20.8
Ithaca	38.1	111	i 7 33	- 6	13 18	-21	20.2	—
Tucson	40.5	160	—	—	e 14 22	+ 8	e 21.7	23.2
Georgetown	41.1	116	8 3	- 1	(e 15 44)	+82	e 15.7	—
Washington	41.1	116	8 3	- 1	13 45	-37	e 20.1	22.8
Cheltenham	41.4	115	8 11	+ 5	16 59	+152	22.1	23.0
	41.4	115	8 13	+ 7	—	—	22.8	22.9
Bidston	48.8	41	10 50	?PR ₁	20 38	?SR ₁	—	—
Oxford	50.7	41	—	—	—	—	—	25.2
Hamburg	51.0	31	e 9 8	- 5	—	—	e 27.1	—
Kew	51.2	40	—	—	—	—	—	32.1
De Bilt	51.6	36	—	—	i 16 41	+ 2	e 24.6	34.0
	51.6	36	—	—	i 16 39	0	e 26.6	29.4
Uccle	52.7	38	e 9 21	- 3	i 16 53	+ 1	—	—
Honolulu	53.5	218	17 38	?S	(17 38)	+35	e 22.8	41.6
Paris	54.3	39	—	—	e 17 8	- 5	—	—
Strasbourg	55.5	35	9 39	- 4	e 17 30	+ 2	31.1	—
Besançon	56.5	38	—	—	17 44?	+ 4	—	—
Moncalieri	58.3	36	10 14	+13	18 17	+14	27.8	40.1
Padova	59.3	33	11 18	+71	19 14	-59	—	—
Osaka	59.5	290	10 7	- 2	—	—	—	11.1
Coimbra	60.1	50	10 19	+ 6	18 29	- 5	e 29.8	37.9
Florence	60.7	35	13 8	?PR ₁	—	—	—	39.1
Barcelona	61.2	41	e 11 16	+56	18 50	+12	e 29.4	38.5
Tortosa	61.5	44	—	—	18 45	+ 3	29.8	40.7
Rio Tinto	62.8	50	20 8	?S	(20 8)	+70	—	51.1
Rocca di Papa	62.9	33	i 10 35	+ 4	i 19 2	+ 2	e 37.2	—
	62.9	33	e 10 32	+ 1	i 19 2	- 2	e 37.1	42.2
Granada	64.1	49	10 50	+11	19 29	+15	—	—
Pompeii	64.2	30	10 57	+18	19 27	+12	—	—
San Fernando	64.2	50	—	—	19 38	+23	38.1	43.6
Algiers	65.9	42	e 10 51	+ 1	—	—	25.1	38.6
Zi-ka-wei	66.8	300	e 10 46	-11	—	—	—	—
Zante	67.9	29	—	—	17 8	?	—	—
Athens	68.4	25	18 38	?S	(18 38)	-89	19.1	19.3
Helwan	77.2	20	22 8	?S	(22 8)	+17	—	—
Manila	82.7	296	e 12 8	-26	—	—	—	—
La Paz	96.6	124	e 16 45	?PR ₁	26 34	+72	46.5	50.8
Batavia	106.6	304	e 18 2	[- 9]	—	—	e 36.6	—

Additional readings: Victoria gives also eL = +14.6m. Lick eN = +18m.28s.

Ottawa LN = +18.5m., T₀ = 8h.30m.54s. Toronto iL = +19.6m. Ann

Arbor gives East component for Bosch-Omori machine, also LN = -19.5m.,

and North component for the Wiechert. Ithaca e = +15m.48s. Wash-

ington PR₁ = -9m.38s. Moncalieri MN = +38.8m. Barcelona i

+19m.26s., MN = +36.9m. San Fernando MN = +44.1m. Athens

MN = +19.2m. La Paz eP? = +16m.24s., i = +17m.44s., T₀ = 8h.35m.3s.?

Nov. 16d. Readings also at 0h. (Apia), 6h. (Colombo), 9h. (Florence), 16h. (Lick and La Paz), 18h. and 19h. (San Fernando).

Nov. 17d. Readings at 2h. (Colombo), 7h. (Lick and near Manila), 8h. (Florence (2) and Taihoku), 12h. (Colombo), 13h. (Tortosa and Colombo), 16h. and 17h. (Lick), 18h. (Helwan), 19h. (La Paz), 21h. (San Fernando), 22h. (Rocca di Papa and Helwan).

Nov. 18d. Readings at 2h. (Florence), 4h. (La Paz), 7h. (Florence), 10h. (Port au Prince), 11h. (3), 13h. and 14h. (Taihoku), 16h. (Florence), 19h. (San Fernando), 21h. (near Athens), 22h. (La Paz, near Tortosa, and near Zurich), 23h. (Tortosa and Port au Prince).

Nov. 19d. Readings at 1h. (near Mizusawa), 2h. (Zi-ka-wei, Taihoku, and Florence), 4h. and 7h. (near Tacubaya), 9h. (near Batavia), 10h. (near Tacubaya), 13h. (near Athens), 21h. (San Fernando), 22h. (La Paz).

Nov. 20d. Readings at 1h. (Zi-ka-wei and near Taihoku), 7h. (Chicago, La Paz, and near Kobe), 8h. (near Osaka), 9h. (Taihoku), 11h. (Manila), 13h. (Helwan, Manila, Taihoku, Zi-ka-wei, and De Bilt), 17h. (La Paz), 21h. (San Fernando).

Nov. 21d. 20h. 57m. 40s. Epicentre $34^{\circ}5'N$, $25^{\circ}0'E$. (as on 1920 Nov. 15d.).

$$A = +.747, B = +.348, C = +.566.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	3.6	0 57	+ 1	e 1 36	- 3	1.7	1.8
Pompeii E.	10.3	2 16	-18	—	—	—	—
Rocca di Papa	12.1	e 3 2	+ 2	—	—	—	4.0

Rocca di Papa also gives $ePN = +2m.38s$.

Nov. 21d. Readings also at 0h. (Denver), 2h. (La Paz and Denver), 6h. (Manila and La Paz), 7h. (near Tacubaya), 15h. (La Paz and near Taihoku), 16h. (Zi-ka-wei), 20h. (Apia), 23h. (San Fernando).

Nov. 22d. Readings at 1h. (near La Paz), 2h. (Helwan), 4h. (La Paz), 19h. (Taihoku), 20h. (San Fernando and Rio Tinto).

Nov. 23d. Readings at 0h. (near Athens), 5h. (La Paz), 6h. (Mizusawa, Manila, and near Batavia), 7h. (Helwan, La Paz, and Riverview), 13h. and 14h. (near Athens), 19h. (La Paz), 20h. (Colombo and near Lick), 22h. (La Paz), 23h. (Rio Tinto).

Nov. 24d. 11h. 51m. 0s. Epicentre $14^{\circ}3'S$, $64^{\circ}2'W$.

$$A = +.422, B = -.872, C = -.247; \quad D = -.900, E = -.435; \\ G = -.108, H = +.222, K = -.969.$$

A depth 0.010 of focus has been assumed, although the evidence is scanty. Perhaps 0.020 would be better.

	Corr. for Focus	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz	0.0	4.4	239	i 1 8	0	2 1	0	2.3	2.5
San Fernando	-1.3	74.5	47	21 0	?S	(21 0)	- 4	—	—
Coimbra	-1.3	75.1	42	21 4	?S	(21 4)	- 8	—	—
Berkeley	-1.3	75.4	318	11 12	-31	—	—	—	—
Granada	-1.3	76.7	47	i 11 23	-28	i 21 35	- 5	—	—
Tortosa	-1.3	81.3	45	21 41	?S	(21 41)	-42	22.4	22.6
Algiers	-1.3	81.3	50	—	—	e 21 51	-32	—	22.4
De Bilt	-1.4	89.1	35	—	—	e 22 54	-55	—	—
Hamburg	1.4	92.4	35	—	—	i 23 13	-71	—	—
Helwan	1.5	101.7	64	24 0	?S	(24 0)	-118	—	—
Manila	—	175.0	274	e 20 0	[-16]	—	—	—	—

Additional readings: Coimbra gives also $iN = +21m.32s$. Berkeley $eV = +11m.11s$.

Nov. 24d. Readings also at 1h., 2h., and 3h. (Rio Tinto), 4h. (Florence), 5h. (La Paz), 6h. (Florence), 11h. (Helwan), 14h. (Colombo), 15h. (Lick), 16h. (near Tokyo), 23h. (Lick and San Fernando).

Nov. 25d. 8h. 38m. 36s. Epicentre $40^{\circ}0'N$. $20^{\circ}0'E$. (as on 1920 Oct. 26d.).

$$A = +.720, B = +.262, C = +.643; \quad D = +.342, E = -.940; \\ G = +.604, H = +.220, K = -.766.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens		3.6	123	e 0 55	- 1	1 39	0	1.8	2.3
Pompeii	E.	4.2	281	1 2	- 3	2 12	+17	(2.2)	3.4
Rocca di Papa		5.8	291	i 1 23	- 7	3 6	?L	e 7.0	4.1
Florence		7.5	303	-0 21	?	—	—	—	6.4
Padova		8.0	315	2 51	+50	5 40	?L	(5.7)	—
Vienna	E.	8.6	344	e 2 13	+ 3	—	—	e 4.3	5.4
	N.	8.6	344	e 2 14	+ 4	4 14	+21	e 4.6	5.4
Moncalieri		10.3	303	0 38	?	4 44	+ 7	7.5	10.2
Zurich		11.0	316	e 2 30	-14	e 6 3	?L	(e 6.0)	—
Strasbourg		12.2	318	—	—	—	—	e 6.9	9.2
Besançon		12.4	310	5 20	?S	(5 20)	- 9	—	—
Puy de Dôme		13.7	300	7 44	?L	—	—	(7.7)	—
Hamburg		15.2	337	—	—	e 6 24	-13	e 8.6	10.5
Paris		15.2	311	—	—	—	—	e 8.4	10.4
Uccle		15.3	320	—	—	—	—	e 8.4	—
De Bilt		15.8	325	—	—	e 6 52	+ 2	8.4	9.4

Additional readings: Athens gives also $iP = +1m.2s$. Strasbourg $MN = +9.1m$. Hamburg $MN = +11.3m$.

Nov. 25d. Readings also at 5h. (La Paz), 8h. (San Fernando), 13h. (near Tacubaya), 21h. (near La Paz).

1920. Nov. 26d. 8h. 51m. 0s. Epicentre $40^{\circ}0'N$. $20^{\circ}0'E$.

(As on Nov. 25d.).

$$A = -.720, B = +.262, C = +.643; \quad D = +.342, E = -.940; \\ G = +.604, H = +.220, K = -.766.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens		3.6	123	1 2	+ 6	1 48	+ 9	e 1.9	2.6
Pompeii		4.2	281	1 11	+ 6	4 46	?	—	5.0
Rocca di Papa	N.	5.8	291	i 1 29	- 1	(2 30)	- 9	(3.5)	3.8
Florence		7.5	303	1 16	-38	—	—	—	4.5
Padova		8.0	315	3 0	?	5 45	?L	(5.8)	—
Vienna	E.	8.6	344	—	—	3 59	+ 6	4.5	5.4
	N.	8.6	344	e 2 8	- 2	4 5	+12	4.6	6.9
Milan		9.6	308	3 30	?S	(3 30)	-48	(5.9)	7.2
Lemberg		10.2	15	—	—	e 4 0	-35	e 5.7	6.0
Moncalieri		10.3	303	(2 49)	+15	2 49	?P	4.9	9.1
Zurich		11.0	316	e 2 39	- 5	i 4 55	+ 1	—	—
Strasbourg		12.2	318	2 5	-57	6 53	?L	(6.9)	9.0
Besançon		12.4	310	3 0	- 5	6 58	?L	(7.0)	—
Barcelona		13.6	288	—	—	—	—	e 6.5	9.0
Algiers		13.7	261	3 21	- 1	6 0	- 1	7.5	13.0
Helwan	E.	13.7	134	4 42	+80	—	—	—	14.2
	N.	13.7	134	3 42	+20	—	—	—	13.8
Tortosa		14.8	279	3 20	-16	6 8	-19	7.2	9.2
Paris		15.2	311	e 3 58	+16	e 6 44	+ 7	8.4	10.0
Hamburg		15.2	337	e 3 34	- 8	e 6 28	- 9	e 8.4	11.6
Uccle		15.3	320	e 3 37	- 6	e 6 36	- 3	8.0	9.0
		15.3	320	i 3 46	+ 3	i 6 44	+ 5	—	—
De Bilt	E.	15.8	325	3 53	+ 4	6 53	+ 3	8.5	9.5
	N.	15.8	325	—	—	6 56	+ 6	8.2	9.5
Kew		18.1	316	4 0	-18	—	—	—	13.0
Granada		18.6	269	4 27	+ 3	8 9	+16	—	—
Oxford		18.8	316	i 4 20	- 7	7 51	- 7	10.9	12.8
Stonyhurst		20.5	320	e 4 42	- 5	8 36	+ 2	11.2	13.1
San Fernando		20.8	269	—	—	—	—	11.2	15.4
Rio Tinto		20.8	272	7 0	?S	(7 0)	-100	—	18.0

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Coimbra	E.	21.7	280	15 0	- 1	8 59	0	11.8	14.5
	N.	21.7	280	—	—	—	—	10.8	15.4
Edinburgh		22.0	324	e 5 0	- 5	9 2	- 3	—	13.7
Kodaikanal		58.7	104	35 54	?L	—	—	(35.9)	—
Colombo		62.7	106	36 0	?L	—	—	(36.0)	40.0
Ottawa		66.2	310	—	—	—	—	e 33.0	—
Toronto		69.3	311	—	—	—	—	e 42.5	43.6
Cape Town		73.9	181	35 46	?L	41 46	?	(35.8)	45.3
Chicago		74.9	313	—	—	—	—	e 34.8	—
Victoria		85.9	337	—	—	—	—	48.8	50.8
Tacubaya		98.4	304	44 46	?L	—	—	(44.8)	—
La Paz		99.2	256	e 17 59	?PR ₁	—	—	53.3	60.9

Additional readings and notes : Athens gives also iP = -1m.14s., i = -1m.21s. +1m.26s. -1m.35s., MN = +2.9m., T₀ = 8h.51m.6s. Rocca di Papa gives S and L as PR₁ and PR₂, also eL = +9.0m. Florence readings given as at 9h. Moncalieri gives P? = 9h.50m.25s., MN = +8.0m. Barcelona eLN = 8h.51m.30s. (? misprint for 57m.). Hamburg MZ = +10.7m. MN = +11.8m., T₀ = 8h.50m.59s. San Fernando MN = +14.0m. Chicago L = +37.0m. and +46.0m.

Nov. 26d. 11h. 38m. 20s. Epicentre 41° 5N. 7° 0W. (as on 1919 Sept. 10d.).

A = +.744, B = -.091, C = +.663, D = -.122, E = -.992;
G = +.658, H = -.081, K = -.749.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Coimbra	1.7	220	0 24	- 2	0 48	0	0.9	1.0
Granada	5.1	148	1 26	+ 7	2 41	+21	3.0	—
San Fernando	5.1	173	3 28	?L	—	—	(3.5)	4.7
Tortosa	5.7	94	1 24	- 4	—	—	2.8	—
Barcelona	6.8	87	1 44	0	(2 53)	-12	2.9	4.2
Paris	9.9	39	—	—	c 3 40	-46	4.9	—
Besançon	10.9	54	4 25	?S	(4 25)	-27	—	—
Oxford	11.0	19	—	—	—	—	4.4	5.8
Uccle	12.2	36	e 2 40	-22	—	—	e 5.7	—
Milan	12.4	66	6 4	?L	—	—	(6.1)	—
Strasbourg	12.5	50	—	—	c 4 47	-45	—	—
De Bilt	13.4	34	—	—	—	—	e 6.3	7.4
Edinburgh	14.6	8	—	—	—	—	6.7	—
Rocca di Papa	14.7	82	—	—	—	—	e 8.2	9.3
Vienna	17.8	60	—	—	—	—	e 8.4	12.7

Additional readings : Milan gives +6m.52s. De Bilt MN = +7.1m.
Rocca di Papa eN = +8m.46s. Hamburg gives simply e = 11.7h.

Nov. 26d. Readings also at 1h. (La Paz), 5h. (La Paz and Lick), 9h. (Tacubaya and Vienna), 10h. (Pompeii, Apia, and Rocca di Papa), 12h. (near Zurich and Milan), 15h. (Milan), 17h. (Apia), 18h. (San Fernando), 19h. (Vienna, Pompeii, and near Tokyo), 21h. (Milan).

Nov. 27d. 16h. 26m. 20s. Epicentre 37° 5N. 27° 5E. (as on 1920 April 2d.).

A = +.704, B = +.366, C = +.609, D = +.462, E = -.887;
G = +.540, H = +.281, K = -.793.

Apparently this is not a repetition from 40° 0N. 20° 0E., as on several occasions during October and November.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Athens	3.0	278	e 0 51	+ 4	—	—	1.3	2.2
Helwan	8.3	156	7 40	?	—	—	—	—
Pompeii	E. 10.5	294	6 24	?L	—	—	(6.4)	—
Rocca di Papa	12.1	295	—	—	—	—	e 6.8	—
Vienna	13.4	326	—	—	e 4 46	-67	7.2	9.7
Padova	14.1	309	8 10	?L	—	—	(8.2)	—
Strasbourg	18.1	314	e 4 17	- 1	—	—	e 11.2	—
Hamburg	20.1	328	—	—	c 7 10	-45	—	—
Uccle	21.1	316	—	—	—	—	e 10.7	—
De Bilt	21.4	320	—	—	—	—	e 11.3	12.5

Additional readings : Athens gives also MN = +2.1m. Rocca di Papa ePN = 7m.16s. De Bilt MN = +11.9m.

Nov. 27d. Readings also at 4h. (Helwan), 7h. (Rocca di Papa), 10h. (Helwan), 11h. (Taihoku), 18h. (San Fernando and La Paz), 23h. (Osaka and Kobe).

Nov. 28d. 8h. 1m. 40s. Epicentre $36^{\circ}5'N$, $19^{\circ}7'E$. (as on 1918 July 18d.).

A = +.757, B = +.271, C = +.595; D = +.337, E = -.942;
G = +.560, H = +.200, K = -.804.

	Δ	Az.	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Athens	3.5	66	e 0 56	+ 1	—	—	e 1.4	1.9
Pompeii	5.9	318	0 32	-59	2 32	- 9	—	—
Rocca di Papa	7.5	317	i 2 8	+14	—	—	—	3.5
Padova	10.7	329	e 3 27	+47	5 59	+71	—	—
Vienna	12.0	349	e 2 50	- 9	—	—	i 3.9	4.0

Athens gives also MN = +2.2m. Rocca di Papa e = +0m.50s., MN = -2.2m.

Nov. 28d. 11h. 29m. 55s. Epicentre $50^{\circ}0'N$, $128^{\circ}0'W$. (as on 1919 July 10d.).

A = -.396, B = -.507, C = +.766; D = -.788, E = +.616;
G = -.472, H = -.604, K = -.643.

	Δ	Az.	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Victoria	3.4	114	0 53	0	—	—	1.6	1.9
z. 3.4	114	0 58	+ 5	—	—	—	1.6	1.8
Berkeley	12.8	159	—	—	—	—	e 6.5	9.2
Lick	13.4	158	—	—	e 6 2	+ 9	e 6.6	—
Chicago	28.9	91	7 45	+88	12 9	+54	15.4	—
Toronto	33.4	81	—	—	—	—	17.0	—
Ottawa	34.8	77	—	—	—	—	e 17.0	—
Ithaca	35.7	82	—	—	—	—	e 17.1	—
Georgetown	37.2	88	—	—	e 12 41	-46	(19.0)	—
Washington	37.2	88	—	—	—	—	15.9	19.2
Northfield	37.3	77	—	—	—	—	e 18.1	—
De Bilt	70.5	29	—	—	—	—	e 38.1	41.6
Helwan	98.1	18	30 5	?	—	—	—	—

Additional readings: Berkeley gives eNV = 11h.35m., MV = +8.3m., M = +8.2m. Lick gives its readings at 10h. De Bilt eLN = +37.1m.

Nov. 28d. Readings also at 1h. (Helwan), 5h. (Taihoku), 6h. (San Fernando), 8h. (Vienna), 13h. (La Paz and near Tokyo), 14h. (Taihoku), 21h. (San Fernando), 23h. (near Tortosa and Barcelona).

Nov. 29d. 8h. 2m. 45s. Epicentre $59^{\circ}0'N$, $149^{\circ}0'W$.

A = -.441, B = -.265, C = +.857; D = -.515, E = +.857;
G = -.735, H = -.441, K = -.515.

	Δ	Az.	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Victoria	18.4	114	4 1	-21	7 28	-21	9.9	11.2
z. 18.4	114	4 45	+23	8 35	+46	—	—	8.9
Berkeley	27.2	129	e 6 8	+ 8	e 10 16	-29	e 11.4	—
Honolulu	38.2	192	14 33	?8	(14 33)	+52	17.0	17.8
Chicago	41.0	88	9 42	+99	15 30	+69	18.4	—
Ann Arbor	42.6	84	9 15	+60	—	—	22.6	—
Toronto	43.8	79	—	—	15 15	+16	e 20.0	28.0
Ottawa	44.4	74	e 9 24	+55	14 56	-11	e 18.1	—
Ithaca	46.1	78	15 28	?8	(15 28)	- 1	24.5	—
Northfield	46.8	73	—	—	e 18 15	?	21.2	—
Georgetown	48.5	82	8 59	+ 2	16 0	0	e 21.2	—
Washington	48.5	82	—	—	16 23	+23	e 20.2	26.8
Zi-ka-wei	63.4	286	e 19 0	?8	(e 19 0)	- 6	—	—
Hamburg	66.1	13	e 10 51	- 1	i 19 36	- 2	e 30.2	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
De Bilt	E.	66.9	17	—	—	19 48	- 1	e 31.2	33.5
	N.	66.9	17	—	—	—	—	e 32.2	36.3
Uccle		68.0	18	e 11 5	+ 1	19 59	- 3	e 32.2	—
Paris		69.7	20	—	—	e 20 17	- 5	—	28.2
Strasbourg		70.7	16	e 11 22	+ 1	e 19 33	-61	20.2	—
Barcelona		76.7	21	—	—	e 21 21	-24	e 36.6	—
Manila		77.5	278	e 17 15	?	—	—	—	—
Pompeii		79.2	12	21 55	?S	(21 55)	-19	—	—
Algiers		81.4	21	e 12 23	- 4	22 19	-20	—	—
Helwan		91.1	359	24 15	?S	(24 15)	-10	—	—
La Paz		99.5	106	e 17 49	?PR ₁	28 19	?	54.3	61.2

Additional readings: Berkeley gives also eN? = +6m.30s. Chicago PR₁ = +10m.39s. Toronto eL = +18.6m., +25.6m., and +27.4m. Ottawa
 L = +32.2m., T₀ = 8h.5m.10s. Ithaca S = +21m.11s. Barcelona iS
 = +22m.22s. Helwan PN = +25m.15s.

Nov. 29d. 15h. 48m. 0s. Epicentre 40° 0N. 20° 0E. (as on Nov. 26d.).

A = +.720, B = +.262, C = +.643; D = +.342, E = -.940;
 G = +.604, H = +.220, K = -.766.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens		3.6	123	e 0 55	- 1	1 41	+ 2	1.8	2.4
Pompeii	E.	4.2	281	e 1 32	+27	2 10	+15	—	3.0
Rocca di Papa		5.8	291	e 1 30	0	—	—	—	3.7
		5.8	291	e 1 32	+ 2	—	—	—	3.6
Florence		7.5	303	1 4	-50	—	—	(3.7)	6.5
Padova		8.0	315	2 24	+23	5 42	?L	(5.7)	—
Vienna	E.	8.6	344	2 25	+15	13 4	-49	i 4.7	5.5
	N.	8.6	344	2 22	+12	13 9	-44	—	6.0
Moncalieri		10.3	303	1 46	-48	5 22	?L	(5.4)	9.2
Zurich		11.0	316	e 2 40	- 4	i 6 35	?L	(i 6.6)	—
Strasbourg		12.2	318	e 2 57	- 5	6 49	+85	e 8.3	9.3
Besançon		12.4	310	5 9	?S	(5 9)	-20	(8.6)	11.0
Helwan		13.7	134	7 0	?L	—	—	(7.0)	—
Tortosa		14.8	279	—	—	—	—	7.2	13.0
Hamburg		15.2	337	e 3 27	-15	—	—	e 8.3	12.2
Paris		15.2	311	—	—	—	—	e 9.0	10.0
Uccle		15.3	320	e 3 48	+ 5	—	—	8.5	—
De Bilt		15.8	325	—	—	—	—	e 8.5	11.8
Oxford		18.8	316	—	—	7 55	- 3	—	13.2
Rio Tinto		20.8	272	15 0	?L	—	—	(15.0)	29.0
San Fernando	E.	20.8	269	12 0	?L	—	—	(12.0)	15.0
Coimbra		21.7	280	—	—	e 9 17	+18	e 13.2	—
Edinburgh		22.0	324	—	—	9 0	- 5	—	—

Additional readings: Athens gives MN = +2.0m. Rocca di Papa eN = +1m.36s., PR₁ = +3m.12s. Moncalieri MN = +8.2m. Hamburg
 MN = +11.5m., MZ = +10.6m. De Bilt MN = +9.5m.

Nov. 29d. Readings also at 4h. (Manila and Taihoku), 8h. (near Tokyo), 18h. (La Paz), 20h. (near Athens), 21h. (Taihoku, Denver, and San Fernando).

Nov. 30d. Readings at 1h. (La Paz and near Osaka and Kobe), 5h. (San Fernando), 7h. (Athens), 8h. (La Paz), 11h. (Helwan, Batavia, Manila, and near Osaka), 12h. (San Fernando), 13h. (La Paz), 15h. (La Paz), 16h. (Helwan), 23h. (Perth and Lick).

Dec. 1d. Readings at 4h. (Batavia), 5h. (Riverview), 7h. (Tacubaya), 9h. (near Manila), 13h. (Batavia), 14h. (Riverview, Apia, Wellington, and Honolulu), 16h. (La Paz), 17h. (Taihoku), 18h. (Rocca di Papa), 19h. (near Batavia).

Dec. 2d. 23h. 40m. 5s. Epicentre $36^{\circ}5'N$, $140^{\circ}5'E$.

$$A = -.620, B = +.511, C = +.595.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
		m. s.	s.	m. s.	s.	m.	m.
Tokyo	1.1	0 19	+ 2	0 30	- 1	0.8	—
Mizusawa E.	2.6	0 38	- 3	1 14	+ 2	—	—
Osaka	4.5	1 36	+26	—	—	2.7	3.2
Kobe	4.7	1 29	+16	—	—	2.7	3.0
La Paz	147.7	19 51	[- 1]	—	—	—	—

Additional readings: Mizusawa gives also $SN = +1m.21s$. Kobe $MN = -2.1m$.

Dec. 2d. Readings also at 0h. (Lick (2), Apia, and San Fernando), 4h. (near Tokyo), 5h. (Zi-ka-wei and Taihoku), 6h. (Zi-ka-wei, Manila, and De Bilt), 9h. (La Paz), 12h. and 18h. (Batavia), 22h. (San Fernando, La Paz, and near Lick), 23h. (near Mizusawa).

Dec. 3d. Readings at 0h. (De Bilt and Helwan), 6h. (near La Paz), 8h. (De Bilt), 9h. (near Strasbourg, Chur, and Zurich), 10h. and 17h. (La Paz), 18h. (La Paz, Tacubaya, Osaka, and Honolulu), 19h. (near Batavia), 21h. (near Apia), 23h. (San Fernando).

Dec. 4d. 5h. 51m. 30s. Epicentre $39^{\circ}0'S$, $23^{\circ}5'E$.

$$A = +.713, B = +.310, C = -.629; \quad D = +.399, E = -.917; \\ G = -.577, H = -.251, K = -.777.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Cape Town	6.5	319	1 48	+ 9	2 42	-15	—	3.3
	6.5	319	1 42	+ 3	2 54	- 3	—	3.7
Colombo	69.4	62	31 30	?L	—	—	(31.5)	38.5
Algiers	78.1	346	e 11 41	-27	21 56	- 5	38.5	42.3
Granada	80.1	339	i 12 25	- 5	i 22 38	-14	—	—
San Fernando E.	80.2	337	11 30	-50	—	—	—	51.5
Batavia	80.9	90	e 12 43	+19	i 22 27	- 7	—	—
La Paz	81.0	258	12 23	- 2	22 31	- 4	36.1	39.1
Rocca di Papa N.	81.3	353	—	—	—	—	e 43.8	47.2
Rio Tinto	81.6	337	45 30	?L	—	—	(45.5)	59.5
Tortosa	82.5	344	—	—	—	—	e 42.5	45.3
Coimbra	84.4	336	—	—	—	—	e 44.2	46.8
Moncalieri	85.2	350	—	—	e 37 49	?	42.1	48.9
Vienna	87.4	356	12 52	- 9	23 42	- 3	e 40.5	52.5
Besançon	87.6	349	—	—	—	—	45.5	—
Strasbourg	88.6	350	—	—	—	—	e 40.5	50.9
Paris	89.7	347	—	—	—	—	e 43.5	48.5
Uccle	91.4	349	—	—	—	—	e 40.5	49.4
De Bilt E.	92.4	350	—	—	—	—	e 39.5	50.3
N.	92.4	350	—	—	—	—	e 47.5	54.6
Kew	92.8	346	—	—	—	—	—	52.5
Oxford	93.3	345	—	—	—	—	e 37.7	52.4
Hamburg	93.3	352	—	—	—	—	e 48.5	51.5
Stonyhurst	95.5	345	e 44 18	?L	—	—	(e 44.3)	52.0
Edinburgh	97.5	346	—	—	—	—	50.5	—

Additional readings: San Fernando gives also $MN = +49.5m$. Batavia $i_1 = +13m.36s$.

Dec. 4d. 23h. 8m. 33s. Epicentre $25^{\circ}0'N$. $119^{\circ}5'E$. (as on 1920 May 29d.).

A = -446, B = +789, C = +423; D = +870, E = +492;
 G = -208, H = +368, K = -906.

	Δ	Az.	P.	O-C.	S.	O-O.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Hokoto	1.5	179	0 12	-11	—	—	0.7	—
Taihoku	1.9	89	0 20	-9	—	—	0.6	0.7
Zi-ka-wei	6.4	15	e 1 38	0	e 3 6	+11	—	4.2
Manila	10.5	172	e 2 38	+ 1	6 6	?L	7.2	8.2
Colombo	42.0	281	27 27	?L	—	—	(27.4)	29.4
Kodaikanal	42.6	257	29 33	?L	—	—	(29.6)	—
Helwan	76.3	297	51 27	?	—	—	—	—
Vienna	79.7	320	e 15 27	?PR ₁	—	—	—	—
Hamburg	80.8	325	—	—	—	—	e 44.4	51.4
De Bilt	84.1	326	—	—	—	—	e 43.4	54.7
Edinburgh	85.7	332	—	—	—	—	47.4	56.4
Stonyhurst	86.7	330	36 21	?	—	—	49.2	57.0
Kew	87.1	327	—	—	—	—	—	55.4
Paris	87.3	324	—	—	—	—	47.4	—
Oxford	87.4	328	—	—	—	—	47.6	57.0
Coimbra	98.8	322	—	—	—	—	e 49.6	—
Rio Tinto	99.3	320	57 27	?L	—	—	(57.4)	67.4
La Paz	168.9	42	20 7	[- 7]	—	—	—	—

Additional readings: Helwan gives also PN = +46m.27s. De Bilt MN = +55.8m. Coimbra eL = +54.3m.

Dec. 4d. Readings also at 1h. (near Tokyo), 2h. (Batavia), 4h. (Granada), 5h. (Kodaikanal), 7h. (Florence), 9h. (Helwan and La Paz), 10h. (Helwan), 18h. (La Paz, Batavia, and near Tokyo and Mizusawa), 19h. (near Tokyo), 20h. (San Fernando), 22h. (Vienna).

Dec. 5d. 10h. 1m. 0s. Epicentre $0^{\circ}0'18''SW$.

A = +947, B = -322, C = 000; D = -322, E = -947;
 G = 000, H = 000, K = -1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
San Fernando	38.3	16	8 48	+68	15 30	+108	23.2	28.0
Granada	39.7	19	7 57	+ 5	14 3	+ 1	—	—
Coimbra	E. 41.3	11	9 27	?PR ₁	14 9	-16	e 17.1	17.2
	N. 41.3	11	—	—	14 13	-12	e 18.3	17.2
Algiers	42.0	28	8 8	- 3	14 22	-13	20.5	24.5
Tortosa	44.4	20	—	—	—	—	e 23.0	32.1
Barcelona	45.6	23	—	—	e 15 33	+11	22.4	28.4
Cape Town	48.7	139	9 1	+ 3	15 58	- 4	(25.4)	39.0
Rocca di Papa N.	50.5	30	i 9 6	- 4	i 16 18	- 7	e 25.8	34.8
Moncalieri	50.7	25	8 17	-54	16 22	- 5	24.8	31.7
Florence	51.3	28	6 30	?	—	—	—	32.5
La Paz	51.4	249	e 9 34	+18	16 21	-15	23.1	26.4
Besançon	51.9	21	15 25	?S	(15 25)	-78	25.0	—
Paris	52.2	18	—	—	e 16 46	0	26.0	27.0
Zurich	53.0	24	e 9 23	- 3	—	—	—	—
Strasbourg	53.7	22	e 9 32	+ 1	17 11	+ 6	e 25.0	33.2
Kew	53.8	13	22 0	?	—	—	—	36.0
Oxford	53.9	13	9 14	-18	17 6	- 2	22.7	36.2
Uccle	54.5	19	e 9 42	- 6	i 17 21	+ 6	e 23.0	28.5
Athens	54.5	41	9 21	-15	e 17 16	+ 1	e 27.3	32.8
Stonyhurst	55.6	12	17 30	?S	(17 30)	+ 1	—	37.0
De Bilt	55.8	19	e 10 6	+21	17 38	+ 7	24.0	27.8
Helwan	E. 56.2	54	13 36	?PR ₁	—	—	—	31.2
	N. 56.2	54	13 0	?PR ₁	—	—	—	29.8
Vienna	57.0	28	i 9 55	- 3	17 53	+ 7	e 27.7	33.7

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	57.3	10	—	—	17 24	-26	24.0	38.4
Hamburg	58.7	19	e 10 6	+ 3	—	—	e 29.0	36.0
Ottawa	67.5	321	—	—	—	—	e 36.3	—
Toronto	69.2	319	—	—	—	—	e 39.7	42.8
Kodaikanal	96.1	80	49 18	?L	—	—	50.6	55.0
Colombo	98.5	84	54 6	?L	—	—	56.2	57.4
Victoria	99.6	320	54 31	?L	—	—	(54.5)	56.0
Lick	N. 100.2	310	—	—	—	—	e 58.2	59.6
Berkeley	100.6	310	—	—	—	—	e 59.6	—

Additional readings and notes: San Fernando gives MN = +27.0m., T_0 = 10h.1m.20s., Barcelona ? = -18m.27s., Cape Town L is given as P on the Milne instrument. Moncalieri MN = -30.0m., La Paz P = 9m.44s., T_0 = 10h.2m.12s., Paris e = +20m.36s., Strasbourg MN = -38.2m., T_0 = 10h.0m.58s., Uccle MN = -33.2m., T_0 = 10h.1m.6s., De Bilt MN = +38.2m., Ottawa e?E = +29m.30s., LE = -38.5m., Athens MN = -33.6m., T_0 = 10h.0m.30s., Lick and Berkeley readings are given 1h. late. Berkeley gives also cN = +58m.43s. and cZ = +59m.39s.

Dec. 5d. 21h. 57m. 24s. Epicentre 7° 2S. 150° 0E. (as on 1920 Jan. 14d.).

A = -859, B = +496, C = -125; D = +500, E = +866;
G = +108, H = -063, K = -992.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	26.7	178	e 5 56	+ 1	e 10 37	+ 2	e 13.5	15.7
Melbourne	31.0	185	—	—	e 11 36	-15	16.6	17.3
Manila	36.1	307	e 7 28	+ 5	—	—	—	—
Perth	40.3	229	15 8	?L	—	—	(15.4)	—
Batavia	42.8	269	e 7 13	-64	—	—	—	16.2
Honolulu	58.4	60	e 10 18	+17	i 16 48	-76	e 22.6	36.1
Victoria	93.2	42	28 57	?	—	—	43.1	47.6
Helwan	118.4	300	30 36	?	—	—	—	—
De Bilt	126.7	334	—	—	—	—	e 57.6	60.7
La Paz	135.5	123	20 20	[+49]	—	—	—	—

Additional readings: Riverview gives MN = +14.8m. De Bilt MN = +64.0m.

Dec. 5d. Readings also at 1h. (near Tacubaya), 2h. (Rio Tinto), 9h. (La Paz), 12h. and 14h. (Taihoku), 15h. (Point Loma), 19h. and 23h. (San Fernando).

Dec. 6d. 1h. 28m. 0s. Epicentre 25° 0N. 119° 5E. (as on 1920 Dec. 4d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Hokoto	1.5	179	0 56	+33	(1 24)	+42	1.4	—
Taihoku	1.9	89	0 24	-5	(0 43)	-10	0.7	1.1
Zi-ka-wei	6.4	15	e 1 38	0	e 3 8	+13	—	4.5
Manila	10.5	172	e 2 50	+13	—	—	—	—
Helwan	76.3	297	53 0	?	—	—	—	—
De Bilt	84.1	326	—	—	—	—	e 44.0	54.8
Strasbourg	84.6	322	—	—	—	—	e 53.0	55.0
Uccle	85.2	324	e 7 0	?	—	—	e 43.0	—
Edinburgh	85.7	322	—	—	—	—	48.0	56.5
Stonyhurst	86.7	330	42 18	?L	—	—	(42.3)	58.5
Kew	87.1	327	—	—	—	—	—	59.0
Paris	87.3	324	—	—	—	—	e 48.0	—
La Paz	168.9	42	17 4	?	—	—	—	—

Additional readings: Zi-ka-wei gives MN = +4.1m. Helwan PN = -48m.0s. (?L). De Bilt MN = +55.8m.

Dec. 6d. Readings also at 3h. (Taihoku), 8h. (San Fernando), 10h. (Rio Tinto and near Batavia), 12h. (Perth), 13h. (Helwan, Vienna, Rocca di Papa, and near Athens), 15h. (Perth), 17h. (La Paz), 18h. (Helwan and Simla), 19h. (Apia), 21h. (Helwan), 22h. (La Paz), 23h. (Apia).

Dec. 7d. 15h. 14m. 30s. Epicentre $13^{\circ}08.166^{\circ}8E$. (as on 1920 Aug. 15d.).

$$A = -.949, B = +.222, C = -.225; \quad D = +.228, E = +.974; \\ G = +.219, H = -.051, K = -.974.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	25.2	213	15 41	+ 1	e 10 5	- 2	e 12.0	13.2
Sydney	25.2	213	5 30	-10	9 52	-15	13.4	14.4
Wellington	29.1	167	7 30	?PR ₁	—	—	18.5	—
Melbourne	31.5	214	—	—	11 54	- 6	e 16.2	17.3
Adelaide	33.6	224	—	—	—	—	e 14.7	22.7
Honolulu	48.6	46	—	—	e 17 0	+59	25.1	32.4
Perth	50.3	239	16 0	?S	(16 0)	-23	—	—
Manila	53.2	300	e 9 26	- 1	—	—	—	—
Batavia	59.4	270	e 9 50	-18	i 18 5	-11	—	—
Victoria	86.9	36	—	—	—	—	44.6	—
Chicago	110.2	49	—	—	19 20	?PR ₁	52.5	—
Toronto	116.1	47	—	—	—	—	71.4	—
Ottawa	118.4	45	—	—	—	—	e 37.0	—
Helwan	135.6	300	41 30	?SR ₁	—	—	—	—
De Bilt	E. 138.2	343	—	—	—	—	e 66.5	73.3
	N. 138.2	343	—	—	—	—	e 67.5	76.8
Uccle	139.6	343	—	—	e 44 30	?	e 66.5	—
San Fernando	155.7	346	33 30	?S	—	—	—	—

Additional readings: Riverview gives also $iP = +6m.13s.$, $PS = +10m.38s.$, $MN = +13.4m.$, $MZ = +13.7m.$, $T_0 = 15h.14m.39s.$ Adelaide gives the following readings as e, $+14m.42s.$, $+18m.36s.$, $+19m.48s.$, and $+22m.0s.$ Victoria $L = +34.8m.$ Toronto $L = 19.2m.$ ($?PR_1$) and $+37.6m.$ ($?SR_1$). Chicago $L = +56.5m.$ and $+63.5m.$ Ottawa $eL = +19.5m.$ ($?PR_1$). Helwan $PN = +40m.30s.$ De Bilt $ePR_1 = +22m.54s.$

Dec. 7d. Readings also at 4h. (La Paz and near Tokyo), 6h. (Batavia and near Zurich), 8h. (San Fernando), 10h. (Florence), 11h. (Manila), 15h. (La Paz), 21h. (Kodaikanal).

Dec. 8d. 3h. 55m. 20s. Epicentre $36^{\circ}7N. 21^{\circ}0E$. (as on 1919 Mar. 6d.).

$$A = +.749, B = +.287, C = +.598; \quad D = +.358, E = -.934; \\ G = +.558, H = +.214, K = -.802.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2.5	60	0 35	- 4	1 6	- 3	1.2	1.3
Rocca di Papa	8.1	311	i 3 4	+61	i 4 34	+54	(i 3.1)	5.9
N. 8.1	311	e 4 10	?L	—	—	—	e 5.9	7.6
Helwan	11.0	125	8 40	?	—	—	—	—
Vienna	12.0	345	e 3 28	+29	—	—	i 5.9	7.1
Moncalieri	13.0	314	e 3 53	+40	—	—	7.8	9.6
Zurich	14.0	324	—	—	—	—	e 6.7	—
Strasbourg	15.3	325	e 3 47	+ 4	—	—	e 6.7	9.8
Uccle	18.4	325	—	—	—	—	e 9.4	10.5
Hamburg	18.5	339	-e 0 32	?	—	—	e 9.7	—
De Bilt	19.0	329	—	—	e 7 51	-11	9.6	10.5
Stonyhurst	23.6	324	13 10	?L	—	—	(13.2)	—
Edinburgh	25.2	327	—	—	—	—	—	14.2

Additional readings: Athens gives also $MN = +1.2m.$ Strasbourg $MN = +7.1m.$ Helwan $PN = +10m.40s.$

Dec. 8d. Readings also at 2h. (Stonyhurst, Edinburgh, De Bilt, Hamburg, and near Tokyo and Mizusawa), 5h. (Batavia), 6h. (Apia and near Balboa Heights), 7h. (San Fernando and near La Paz), 11h. (La Paz), 14h. (near Tokyo), 16h. (near Batavia (2)), 19h. (Helwan, San Fernando, and Rio Tinto), 20h. (Batavia).

Dec. 9d. Readings at 1h. (Taihoku), 2h. (Denver and La Paz), 5h. (Athens), 10h. (Rocca di Papa), 14h. (Batavia), 15h. (De Bilt and near Tokyo), 18h. (La Paz and near Tacubaya), 19h. (De Bilt), 20h. (4) and 21h. (near Algiers), 23h. (La Paz).

1920. Dec. 10d. 4h. 25m. 35s. Epicentre **39°0S. 74°5W.**

A = +208, B = -749, C = -629; D = -964, E = -267;

G = -168, H = +606, K = -777.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	N.	23.2	16	i 5 20	+ 1	i 9 30	+ 1	12.4	14.1
Porto Rico	E.	57.8	11	e 17 47	?S (e 17 47)	—	- 9	32.1	32.6
	N.	57.8	11	e 17 52	?S (e 17 52)	—	- 4	35.2	—
Oaxaca		59.8	335	10 38	+27	19 18	+57	29.4	31.8
Tacubaya	E.	62.8	333	10 31	0	19 9	+11	31.4	38.4
	N.	62.8	333	10 28	- 3	19 6	+ 8	30.5	36.3
Cape Town		71.5	120	20 44	?S (20 44)	—	0	30.4	34.9
		71.5	120	21 5	?S (21 5)	—	+21	31.3	46.2
Christchurch		77.6	225	33 43	?	—	—	57.4	78.9
Wellington		77.9	227	e 12 43	-37	e 22 19	+20	—	46.4
Georgetown	E.	77.9	359	e 12 25	+19	—	—	e 38.4	—
	N.	77.9	359	e 12 25	+19	22 9	+10	e 39.7	—
Washington		77.9	359	12 23	-17	22 3	+ 4	e 37.8	—
Tucson	E.	78.9	330	—	—	e 18 35	?	34.4	43.0
Ithaca		81.5	359	—	—	e 22 37	- 4	38.4	—
Chicago		81.6	351	12 37	+ 9	22 41	- 1	39.4	—
Ann Arbor	E.	81.7	354	—	—	21 55	-48	36.7	—
	N.	81.7	354	11 55	-34	21 49	-54	36.6	—
Toronto		82.7	356	—	—	e 23 31	+37	e 35.4	64.9
Ottawa		84.4	0	i 12 58	+14	i 23 10	- 2	e 40.1	—
Apia		86.9	258	—	—	e 24 31	+51	37.4	—
Berkeley		88.5	325	—	—	—	—	e 42.4?	—
Melbourne		95.1	210	24 49	?S (24 49)	—	-18	45.8	50.9
Riverview		95.8	218	e 24 22	?S (e 24 22)	—	-52	e 44.5	48.5
Sydney	E.	95.8	218	—	—	44 25	?	46.9	49.0
Victoria		97.5	330	i 26 23	?S (i 26 23)	—	+52	49.0	53.0
San Fernando		98.2	50	24 13	?S (24 13)	—	-85	54.1	66.4
Honolulu		98.5	290	—	—	e 25 25	-16	46.4	53.4
Rio Tinto		98.9	49	19 25	?PR ₁	—	—	—	55.4
Coimbra	E.	99.5	45	e 14 27	+19	24 39	-72	45.3	53.4
	N.	99.5	45	13 32	-36?	—	—	44.1	53.3
Adelaide		100.0	208	—	—	e 24 43	-73	e 50.0	55.8
Granada		100.2	50	13 35	-37	i 27 41	+103	—	—
Algiers		104.0	54	e 16 40	+130	24 52	-101	40.9	57.4
Tortosa		105.1	50	e 24 25	?S (e 24 25)	—	-138	e 48.4	65.2
Barcelona	E.	106.4	50	—	—	e 26 42	-14	e 47.6	56.9
	N.	106.4	50	—	—	—	—	e 37.4	54.0
Perth		108.4	190	26 45	?S (26 45)	—	-29	—	—
Puy de Dôme		109.4	45	28 45	?S (28 45)	—	+82	—	—
Oxford		110.8	38	—	—	e 25 32	-123	47.9	59.6
Paris		111.0	42	—	—	e 28 40	+63	50.4	59.4
Kew		111.1	39	26 25	?S (26 25)	—	-73	—	74.4
Stonyhurst		111.5	37	20 25	?PR ₁	27 7	-35	50.8	69.6
Moncalieri		111.7	48	e 21 11	?PR ₁	35 19	?SR ₁	49.1	73.4
Besançon		112.0	46	—	—	—	—	50.4	—
Rocca di Papa		113.0	53	e 20 55	?PR ₁	—	—	e 55.9	69.9
Uccle		113.2	41	e 19 43	?PR ₁	i 29 0	+64	51.4	61.0
Florence		113.2	50	—	—	26 25	-91	—	63.4
Zurich		113.5	47	—	—	—	—	e 51.6	—
Pompeii		113.6	56	19 43	?PR ₁	28 43	+44	56.4	68.4
Strasbourg		113.7	45	e 19 12	?	e 28 25	+25	52.0	64.7
De Bilt		114.2	41	—	—	e 27 24	-40	e 51.4	61.4
Padova		114.4	50	20 54	?PR ₁	30 39	?	52.5	75.6
Seychelles		116.7	120	32 25	?	—	—	—	69.8
Hamburg		117.5	41	e 20 1	?PR ₁	—	—	e 51.4	68.4
Vienna		118.5	49	e 20 10	?PR ₁	e 31 19	?	e 50.4	61.6
Helwan	E.	119.8	75	22 31	?	—	—	—	82.7
	N.	119.8	75	23 31	?	—	—	—	79.7
Batavia		134.8	180	—	—	—	—	56.8	56.9
Colombo		140.5	138	71 25	?L	79 25	?	83.4	85.4
Kodaikanal		141.8	130	50 7	?	—	—	72.7	80.3
Bombay		145.4	117	71 24	?L	—	—	(71.4)	—
Manila		152.1	213	e 24 25	?PR ₁	e 42 25	?SR ₁	—	—
Taihoku		160.6	229	—	—	e 48 20	?	e 54.4	—
Zi-ka-wei		164.9	244	—	—	e 34 57	?	e 49.8	—

For Notes see next page.

NOTES TO DEC. 10d. 4h. 25m. 35s.

Additional readings: La Paz gives also LE = +12.2min., T_0 = 4h.25m.42s.
 Epicentre 39° 08. 72° 0W. Porto Rico gives S as P and records eSE = +24m.15s., Cape Town S = +28m.39s. and +25m.35s., Christchurch S = +42m.25s., SR₁ = +47m.13s., Wellington e = +14m.49s., +16m.13s., and +22m.37s., Georgetown LE = +41.4m., LN = +44.4m., Washington L = +59.4m., Chicago L = +44.4m., and +56.4m., Toronto S = +26m.37s., eL = +46.8m., and +49.0m., L = +60.1m., eL = +64.6m., L = +76.7m., eL = +106.1m., L(Rep.) = +142.8m. and +173.4m., Ottawa L = +46.4m., +59.4m., and +69.4m., T_0 = 4h.26m.19s., Melbourne S = +33m.55s., SR₁ = +38m.55s., SR₂ = +40m.55s., Riverview eS? = -31m.52s., e = +41m.0s., and +41m.31s., MZ = +47.7m., MN = +52.6m., Victoria iS = +31m.48s., eL = +77.6m., San Fernando MN = +62.4m., Honolulu i = +33m.7s., L = +42.3m., Adelaide i = +27m.25s., e = +29m.55s., +32m.37s., +34m.37s., +37m.1s., and +41m.25s., i = +44m.49s., and +47m.49s., e = +69.7m., Algiers L = +37.4m., Oxford e = -39m.1s., Paris e = +34m.39s., Moncalieri MN = +65.0m., Uccle i = +35m.16s., MN = +59.6m., Strasbourg MN = +58.6m., De Bilt eE = +23m.36s., e = +29m.15s., e = +35m.31s., MN = +70.6m., Epicentre 39° 48. 72° 0W. Hamburg MNZ = +63.6m., Vienna eZ = +33m.30s., eSE = +45m.20s., eLE = +56.4m., MZ = +70.9m., All these readings are given as on 9d. Batavia i = +23m.11s., +25m.17s., and 26m.54s., L = +71.2m., eL = +93.1m., eLE = +103.1m., 108.4m., and 115.4m.

Dec. 10d. 18h. 35m. 18s. Epicentre 36° 7N. 21° 0E. (as on 1920 Dec. 8d.).

A = +.749, B = +.287, C = +.598; D = +.358, E = -.934;
 G = +.558, H = +.214, K = -.802.

	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	2.5	60	i 0 41	+ 2	1 10	+ 1	i 1.2	1.9
Pompeii	6.4	310	3 0	?L	—	—	(3.0)	4.7
Rocca di Papa	8.1	311	e 1 36	-27	3 30	-10	—	4.9
Helwan	11.0	125	7 42	?L	—	—	(7.7)	—
Padova	11.1	324	3 10	+24	—	—	—	—
Vienna	12.0	345	e 3 39	+40	—	—	—	7.8
Moncalieri	13.0	314	e 4 21	+68	6 16	?L	(6.3)	—
Strasbourg	15.3	325	—	—	—	—	e 6.3	8.7
Uccle	18.4	325	—	—	—	—	e 10.2	—
De Bilt	19.0	329	—	—	e 7 48	-14	e 10.7	12.3

Additional readings: Athens gives MN = +1.6m. Helwan PN = +6m.42s.
 De Bilt MN = +10.9m., T_0 = 18h.35m.21s.

Dec. 10d. Readings also at 1h. (near Nagasaki), 3h. (Stonyhurst (3)), 6h. and 8h. (La Paz), 12h. (Apia and Helwan), 13h. (La Paz and near Athens (2)), 17h. (La Paz), 18h. (Apia and La Paz), 20h. (Batavia), 22h. (near Tacubaya).

Dec. 11d. 21h. 22m. 18s. Epicentre 14° 5N. 91° 0W (as on 1920 Mar. 23d.).

A = -.017, B = -.968, C = +.250; D = -1.000, E = +.018;
 G = -.004, H = -.250, K = -.968.

	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Oaxaca	E. 6.1	296	2 19	+46	—	—	3.6	4.0
	N. 6.1	296	—	—	—	—	3.3	3.7
Tacubaya	9.3	304	2 44	+24	4 54	+44	5.1	5.5
Vieques	E. 24.8	78	—	—	e 14 21	?L	16.3	—
Tucson	E. 25.4	318	—	—	—	—	e 16.0	18.0
Georgetown	27.3	24	e 5 42	-19	11 26	+40	e 16.4	—
Washington	27.3	24	6 1	0	11 25	+39	e 16.3	—
Chicago	27.4	6	4 40	-82	10 28	-20	11.7	—
Ann Arbor	E. 28.5	12	5 48	-25	11 42	+34	15.7	—
	N. 28.5	12	6 12	-1	11 18	+10	15.9	—
Ithaca	30.7	23	—	—	e 12 24	+38	19.4	—
Toronto	30.8	17	—	—	12 6	+18	i 18.3	20.3
Ottawa	33.5	20	8 27	?R ₁	12 30	-2	e 14.6	—
Berkeley	36.2	316	—	—	—	—	e 19.7	—
La Paz	38.3	143	7 37	-3	13 35	-7	18.2	22.5

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Victoria		43.1	329	—	—	(14 25)	-24	e 25.0	29.3
Honolulu		63.7	287	e 11 54	+78	i 20 24	+75	e 30.6	36.1
Coimbra		75.2	52	—	—	(e 21 52)	+24	e 21.9	—
Edinburgh		76.8	35	—	—	—	—	—	51.7
Rio Tinto		76.8	54	22 42	?S	(22 42)	+55	—	25.2
San Fernando	N.	77.3	55	15 42	?PR ₁	—	—	—	47.7
Stonyhurst		77.5	37	22 30	?S	(22 30)	+35	13.2	52.2
Oxford		78.5	40	—	—	—	—	39.2	47.1
Kew		79.2	39	—	—	—	—	—	53.7
Paris		81.4	42	—	—	—	—	e 48.7	50.7
Uccle		82.2	40	—	—	e 22 42	-6	e 38.7	51.7
De Bilt	E.	82.5	38	—	—	e 22 54	+2	e 39.7	51.0
	N.	82.5	38	—	—	—	—	e 37.7	50.0
Hamburg		84.7	37	—	—	—	—	e 47.7	—
Strasbourg		84.9	41	e 12 49	+2	—	—	e 44.7	50.7
Rocca di Papa		90.3	47	—	—	—	—	e 41.3	46.3
Helwan		108.9	51	28 42	?SR ₁	—	—	—	—
Melbourne		125.6	234	—	—	—	—	e 61.2	67.7
Adelaide		131.1	235	—	—	—	—	e 62.7	72.4

Additional readings : Oaxaca gives MZ = +3.8m. Tacubaya MN = +5.9m.
 Readings given as at 20h. Tucson eE = +8m.36s., eN = +14m.9s., eE =
 +14m.34s., eLN = -17.0m. Georgetown eN = -4m.33s. Chicago
 L = +18.7m. Toronto SR₁? = +13m.24s., eL = +24.3m. Ottawa
 L = +18.7m., T₀ = 21h.25m.41s. Victoria gives S as L. Adelaide
 e = +66.4m.

Dec. 11d. Readings also at 1h. (San Fernando), 2h. and 3h. (Zante), 6h. (La Paz),
 7h. (Zante and Manila), 11h., 14h., 18h. (2), and 19h. (La Paz).

Dec. 12d. Readings at 1h. (La Paz), 3h. (Vienna, Strasbourg, and near Zurich),
 6h. (La Paz), 7h. (Apia and La Paz), 8h. (near Tacubaya), 14h. (Padova
 and Florence), 15h. (Point Loma).

Dec. 13d. 3h. 42m. 30s. Epicentre 7°-0S. 157°-0E.

A = -.914, B = +.388, C = -.122; D = +.391, E = +.920;
 G = +.112, H = -.048, K = -.993.

The origin of 1918 July 21d. 7°-0S. 155°-0E. is too far to the west to suit Honolulu
 and Batavia.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Riverview		27.4	191	e 5 57	-5	10 42	-6	e 11.6	14.1
Adelaide		32.7	210	e 6 18	-36	i 11 30	-49	13.9	17.8
Melbourne		32.7	198	12 12	?S	(12 12)	-7	17.1	17.8
Wellington		37.8	159	e 7 42	+6	i 13 42	+7	i 17.5	23.5
Christchurch		39.0	162	7 36	-10	14 0	+8	22.2	23.6
Perth		45.7	231	8 30	-8	—	—	—	—
Batavia		49.8	269	e 9 8	+2	—	—	24.1	—
Honolulu		52.4	57	9 24	+2	i 17 6	+17	26.0	35.2
Victoria		88.5	41	22 37	?S	(22 37)	-81	40.4	47.4
Chicago		113.5	47	29 7	?S	35 0	?SR ₁	e 39.7	—
Toronto		118.8	42	—	—	—	—	e 65.0	81.8
Ottawa	E.	120.6	40	—	—	e 36 55	?SR ₁	e 56.5	—
Georgetown	N.	122.0	47	—	—	e 34 41	?	59.5	—
Washington		122.0	47	—	—	—	—	e 58.5	—
Helwan		124.2	301	20 30	?PR ₁	—	—	—	—
De Bilt		129.3	337	—	—	—	—	e 57.5	64.7
La Paz		129.5	120	19 44	[+27]	31 9	?	63.5	67.0
Stonyhurst		130.2	342	34 30	?S	—	—	—	133.5
Paris		132.9	337	24 30	?PR ₁	—	—	—	—
Coimbra		144.3	340	—	—	—	—	e 57.5	—
San Fernando	E.	146.8	335	115 30	?	—	—	—	126.5

Additional readings : Riverview gives also PS = +11m.29s., MZ = +14.8m.,
 T₀ = 3h.42m.28s. Adelaide e = +9m.0s., i = +12m.12s., SR₁ = +13m.0s.,
 i = +16m.6s., and +17m.0s. Melbourne S = +15m.54s., SR₁ = +16m.12s.
 Christchurch SR₁ = -17m.42s. Victoria S = +29m.3s. Chicago
 L = +53.5m., +55.5m., and +67.5m. Toronto e = +59m.48s., eL =
 +80.5m., and +83.8m. Ottawa LE = +69.5m. and 79.5m. George-
 town LE = +58.5m. Helwan PN = +27m.30s. De Bilt ePR₁ =
 +22m.33s., MN = +63.9m. La Paz i = +23m.42s., L = +56.5m., T₀ =
 3h.48m.39s. San Fernando MN = +118.5m.

Dec. 13d. Readings also at 1h. (San Fernando), 15h. (San Fernando), 16h. (2) and 17h. (La Paz), 21h. (Taihoku).

Dec. 14d. Readings at 2h. (near Osaka), 5h. (Taihoku), 11h. (Helwan), 12h. (La Paz), 15h. (Stonyhurst), 22h. (near Tokyo).

Dec. 15d. Readings at 1h. (Florence), 3h. (Point Loma), 6h. (near Tokyo), 7h. (Florence and near Mizusawa), 12h. (near Manila).

1920. Dec. 16d. 12h. 5m. 43s. Epicentre 35° 79'N. 105° 74'E.

A = -219, B = +781, C = +585; D = +963, E = +271;
G = -158, H = +563, K = -811.

See Note at end for discussion of these adopted values.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		m.	s.	m.	s.	m.	s.	m.	m.
Zi-koda-wei		13.9	103	i 3 33	+ 8	e 6 2	- 4	—	—
Hokoto		17.1	131	4 7	+ 1	5 56	-84	7.7	10.3
Taihoku		17.4	122	i 4 25	+15	(7 56)	+29	7.9	—
Calcutta	N.	20.1	233	4 47	+ 5	8 29	+ 4	—	—
Nagasaki		20.2	91	4 34	- 9	(8 18)	- 9	8.3	59.7
Kobe	E.	24.0	83	4 27	-61	(8 33)	-71	8.6	—
	N.	24.0	83	6 15	+47	(9 37)	- 7	9.6	—
Osaka		24.4	83	5 30	- 2	(9 52)	0	9.9	10.1
Manila		25.2	142	e 5 46	+ 6	9 57	-10	12.0	12.4
Nagoya		25.4	82	5 39	- 3	—	—	—	—
Tokyo		27.6	80	6 1	- 3	(10 55)	+ 3	10.9	29.8
Mizusawa	E.	28.1	72	6 1	- 8	10 39	-22	—	—
	N.	28.1	72	6 3	- 6	10 39	-22	—	—
Ootomari		29.7	57	6 11	-14	(11 5)	-24	11.1	—
Bombay		33.4	248	6 46	-14	—	—	—	—
Kodaikanal		36.2	232	7 23	- 1	—	—	10.9	28.4
Colombo		37.3	226	6 59	-33	8 47	?	11.8	—
Batavia		42.0	178	i 8 6	- 5	14 38	+ 3	—	15.0
Malabar		43.1	177	i 8 15	- 4	e 14 47	- 2	i 22.0	—
Lemberg		58.4	312	e 9 59	- 2	e 17 59	- 5	e 21.9	31.9
Helwan		61.3	288	10 5	-16	—	—	—	—
Seychelles		61.8	241	11 47	+83	—	—	20.3	—
Athens	E.	63.3	299	e 10 29	- 5	19 4	- 1	e 32.3	37.4
	N.	63.3	299	—	—	—	—	e 29.8	36.0
Vienna	E.	63.7	312	i 10 39	+ 3	i 19 16*	+ 7	e 25.8	36.6
	N.	63.7	312	i 10 37	+ 1	19 13	+ 4	e 26.3	32.3
	Z.	63.7	312	e 10 33	- 3	19 15	+ 6	—	37.8
Hamburg	Z.	65.0	319	e 10 45	0	i 19 35	+10	i 29.7	—
Padova		67.8	311	11 6	+ 3	—	—	26.9	36.5
Pompeii		68.3	305	12 17	+71	21 17	+71	28.3	39.3
De Bilt		68.3	320	11 10	+ 4	20 7	+ 1	32.3	—
Perth		68.4	171	41 32	?L	—	—	(41.5)	—
Chur		68.5	313	11 12	+ 4	20 8	0	—	—
Strasbourg		68.7	315	i 11 6	- 3	20 3	- 7	e 30.8	35.3
Zurich		68.8	314	e 11 7	- 3	e 20 10	- 2	—	—
Florence		68.9	310	11 17	+ 7	20 12	- 1	24.5	37.3
Rocca di Papa	E.	69.1	308	i 11 11	- 1	e 20 31	+16	24.9	38.2
	N.	69.1	308	—	—	e 20 29	+14	e 24.1	—
Milan		69.3	312	11 5	- 8	36 29	?L	(36.5)	37.8
Uccle		69.3	318	e 11 11	- 2	20 20	+ 2	34.3	—
Neuchatel		69.9	314	11 23	+ 7	—	—	—	—
Besançon		70.3	316	11 21	+ 2	20 35	+ 5	25.3	—
Moncalieri		70.5	312	11 22	+ 2	i 20 32	0	25.7	38.3
Kew		71.4	321	10 17	-69	—	—	—	—
Paris		71.4	318	e 11 27	+ 1	e 20 21	-22	—	25.3
Oxford		71.8	321	11 32	+ 4	20 48	0	24.3	—
Sitka	N.	73.9	30	e 11 48	+ 7	e 21 18	+ 5	33.5	40.1
Barcelona		75.8	311	11 56	+ 2	i 21 34	- 1	e 32.9	48.3
Adelaide		77.1	151	i 11 29	-33	i 22 5	+15	e 35.3	49.9
Tortosa		77.2	312	11 57	- 5	21 50	- 1	34.0	44.3
Alkiers		78.0	307	12 4	- 3	21 56	- 4	37.3	45.8
Riverview		81.6	143	e 12 32	+ 4	i 22 45	+ 3	e 33.6	35.8
Sydney		81.6	143	12 29	+ 1	22 47	+ 5	42.3	45.7
Melbourne		82.1	150	12 59	+28	(22 47)	0	22.8	—
Granada		82.1	311	e 12 37	+ 6	22 49	+ 2	—	—
Honolulu		82.5	69	12 41	+ 8	i 22 59	+ 7	—	54.3
Coimbra	E.	82.9	315	12 29	- 6	i 22 46	-10	40.6	45.9
Rio Tinto		83.4	313	16 17	?PR ₁	—	—	—	51.3
San Fernando		84.0	311	12 44	- 2	22 53	-15	32.6	41.3
Victoria		85.2	30	13 44	+55	19 23	-238	i 31.1	48.9
	Z.	85.2	30	10 47	-122	17 47	?PR ₁	27.3	47.3

Continued on next page.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Saskatoon	N.	88.1	19	12 56	-10	23 36	-17	e 38.3	50.3
Apia		92.1	105	13 35	+ 7	24 23	-13	e 43.4	45.1
Berkeley	E.	94.0	36	e 13 32	- 6	e 24 3	-53	e 41.4	55.0
	N.	94.0	36	e 13 35	- 3	e 24 1	-55	e 40.2	59.6
	Z.	94.0	36	e 13 26	-12	—	—	e 41.8	54.9
Ottawa		98.8	1	13 44	-20	24 23	-81	e 46.3	—
Denver	E.	99.4	22	23 17	?S	(23 17)	-153	47.3	52.3
Wellington		99.7	135	14 17	- 8	24 47	-66	43.9	67.9
Christchurch		99.9	137	18 41	?PR ₁	25 5	-50	42.8	69.0
Northfield		100.0	358	—	—	24 42	-74	e 40.3	60.3
Toronto		100.5	3	—	—	24 35	-86	i 50.5	62.1
Ann Arbor	E.	101.4	6	14 17	0	24 29	-100	45.7	62.2
	N.	101.4	6	14 11	- 6	24 35	-94	46.1	62.2
Chicago		101.5	9	14 2	-16	24 17	-113	—	—
Ithaca		101.7	1	i 18 35	?PR ₁	—	—	42.8	—
Tucson	E.	103.7	30	18 36	?PR ₁	—	—	43.8	59.3
Georgetown	E.	105.3	2	e 18 49	?PR ₁	—	—	33.9	59.3
	N.	105.3	2	e 18 43	?PR ₁	25 4	-101	46.3	66.6
	Z.	105.3	2	e 18 46	?PR ₁	24 41	-124	e 33.8	67.6
Washington		105.3	2	14 24	-12	24 58	-107	43.3	—
Cheltenham	E.	105.4	2	19 17	?PR ₁	—	—	45.6	66.0
	N.	105.4	2	18 31	?PR ₁	—	—	56.9	64.5
Capetown		107.1	240	20 11	?	27 41	+39	53.2	69.2
Mazatlan		113.5	30	—	—	32 28	?	43.7	59.2
Tacubaya	E.	120.0	27	19 49	?PR ₁	32 30	?	53.5	65.6
	N.	120.0	27	19 48	?PR ₁	30 34	?	59.3	63.6
Oaxaca	N.	122.9	24	21 46	?PR ₁	33 21	?	55.0	66.9
Vieques	E.	125.3	349	—	—	e 31 7	?	54.0	70.7
	N.	125.3	349	—	—	e 32 29	?	57.8	72.0
Port au Prince		125.6	357	—	—	—	—	71.8	—
Balboa Heights	N.	134.9	6	19 55 [+ 25]	28 1	?	?	33.7	79.3
La Paz	E.	160.0	342	i 20 15 [+ 7]	34 27	?	?	68.9	87.4
	N.	160.0	342	—	—	—	?	68.3	76.4

Additional readings and notes: Calcutta PE = +4m.41s. (O-C = -1s.), T₀ = 12h.5m.53s. Osaka MN = +10.0m. Tokyo S = +7m.59s. (?PR₁), Batavia i = +9m.40s. and +13.3m., T₀ = 12h.5m.34s. Malabar i = +8m.43s., iN = +9m.35s., iE = +10m.30s., iN = +10m.55s. and +11m.55s., L = +17.0m., LME = +18.8m., iL = +25.4m. Helwan PN = +8m.29s. Athens iE = +19m.11s., iN = +19m.15s., SR₁ = +23m.14s., SR₂ = +25m.57s., T₀ = 12h.5m.38s. Vienna ePR₁ = +13m.29s., PR₂E = +14m.24s., ePR₂ = +14m.35s. Epicentre 36°-0'N. 106°-0'E. Hamburg iSE = +19m.24s., iSN = +19m.30s., eSR₁ = +24m.0s., eSR₂ = +26m.46s., T₀ = 12h.5m.50s. De Bilt PR₁ = +13m.41s., PR₂ = +15m.17s., T₀ = 12h.5m.56s. Epicentre 36°-0'N. 105°-5'E. Padova reading has been increased by 1h. Strasbourg PR₂ = +15m.25s., SR₁E = +24m.40s., SR₁N = +24m.54s., SR₂N = +27m.28s., SR₂E = +27m.29s., MN = +38.2m., MZ = +42.5m., T₀ = 12h.5m.52s. Florence P = +11m.12s., S = +20m.17s. and +20m.42s., L = +24.3m. Rocca di Papa iSN = +20m.7s. and +20m.17s., iSE = +20m.23s., eLV = +26.1m. Milan P = +11m.50s. Uccle iP = +11m.16s., iPR₁ = +15m.32s., SR₁ = +25m.6s., SR₂ = +27m.48s. Epicentre 38°-0'N. 110°-0'E., T₀ = 12h.5m.44s. Moncalieri MN = +37.3m. Paris iP = +11m.30s., T₀ = 12h.6m.16s. Barcelona ? = +26m.17s., MN = +41.0m., T₀ = 12h.5m.59s. Adelaide e = +10m.17s., iP? = +14m.5s., iPR₁ = +15m.29s., ePR₂? = +17m.5s., PR₃ = +18m.11s., then 8 'i' readings followed by iSR₂ = +31m.5s., eSR₃ = +32m.47s. Algiers MN = +44.6m., T₀ = 12h.5m.53s. Riverview iP = +12m.38s. and +12m.53s., PR₁ = +15m.49s., i = +22m.52s., +22m.59s., and +23m.0s., PS = +23m.34s., eSR₁ = +27m.37s., and -28m.47s., MZ = +46.9m., T₀ = 12h.5m.55s. Sydney SR₁ = +28m.11s., SR₂ = +32m.47s. Melbourne S = +18m.5s. (?PR₁), SR₁ = +20m.29s. Granada iP = +12m.47s., T₀ = 12h.6m.6s. Honolulu iSR₁ = +28m.53s., T₀ = 12h.6m.6s. Coimbra SR₁N = +28m.7s., SR₁E = +28m.59s., SR₂N = +31m.47s., SR₂E = +32m.23s., MN = +43.8m., T₀ = 12h.5m.53s. San Fernando MN = +45.3m., T₀ = 12h.6m.16s. Victoria SR₁? = +21m.1s., SR₂ = +22m.39s., SR₃ = +23m.27s., SR₄ = +24m.39s., i = +28m.21s., L = +38.3m. Saskatoon SR₁N = +29m.42s., T₀ = 12h.5m.56s. Apia i = +18m.17s., PS = +25m.35s., SR₁ = +30m.35s., i = +37m.17s., and +39m.17s., T₀ = 12h.5m.59s. Ottawa eE = +31m.30s., iN = +32m.21s., eE = +40.3m., T₀ = 12h.6m.45s. Wellington ePR₁ = +18m.41s., eS = +25m.47s., +27m.35s., and +33m.35s. (?SR₁). Northfield L = +49.3m. and -54.3m. Denver LN = +49.3m., MN = +51.3m. Toronto PR₁? = +23m.35s., SR₁ = +25m.53s., SR₂ = +28m.41s., SR₃ = +33m.17s., i = +39m.17s., and +41m.17s., L? = +42.3m., eL = +43.4m., L = +46.1m. Chicago PR₁ = +18m.2s. Tucson eN = +18m.33s., eE = +26m.5s., iE = +33m.27s., eN = +33m.57s., MN = +65.5m. Washington PR₁ = +18m.46s., L = +54.3m. Mazatlan MN = +59.1m. Oaxaca LE and LZ = +54.9m., ME and MZ = +67.0m. Vieques eE = +37m.28s., iN = +38m.27s., eN = +43m.27s. Port au Prince LNW = +54.3m., LNW = +73.3m. Balboa Heights ME = +76.3m. La Paz PR₁ = +24m.25s., PR₂ = +28m.21s., i = +31m.13s., SR₁ = +37m.53s., T₀ = 12h.6m.49s.

Discussion of the Residuals of 1920 Dec. 16d. 21h.

It is important that the material supplied by this earthquake, probably the best observed up to this date, should be fully scrutinized, since we may therefrom obtain at least provisional answers to several important questions.

(1) Are the Tables of Dr. Klotz preferable to those hitherto adopted for use?

At the Madrid meeting of the Geodetic and Geophysical Union, M. Somville expressed the opinion that the tables of Dr. Klotz gave rather more accordant residuals than those in use. It so happened that the work at Oxford had just reached this earthquake, which awaited final examination on Professor Turner's return from Madrid; and the residuals were therefore first examined on this point. The epicentre adopted was $35^{\circ}5'N$, $105^{\circ}5'E$, and $T_0 = \text{Dec. 16d. 12h. 5m. 46s.}$ These were ultimately given slight corrections in view of the discussion which follows; but these approximate values suffice for the moment.

The following table shows the mean correction to tables at various epicentral distances, according to both sets of tables:—

Limits of Δ	No. of Obsn. P. S.	Mean Corrections.			Klotz's Tables.		
		Adopted Tables.					
		δP .	δS .	δT_0 .	δP .	δS .	δT_0 .
		s.	s.	s.	s.	s.	s.
10-20	5 4	+1.4	+3.5	-1.2	+6.8	+8.2	+5.0
21-30	5 5	-9.4	-14.2	-3.4	-8.0	-13.2	-1.5
31-50	4 2	-7.2	+1.5	-18.1	-2.2	+7.5	-14.3
51-64	3 3	-5.8	-2.0	-10.6	-1.0	+3.8	-7.0
65-70	10 8	-3.4	-1.9	-5.3	+3.8	+5.8	+1.3
71-80	9 8	-3.8	-4.1	-3.4	+5.2	+5.4	+4.9
81-89	3 7	-2.1	-6.6	+3.4	-10.0	+5.1	+16.1

Looking first at the corrections for P and S, these results show that neither set of tables can be considered as finally satisfactory: both require corrections on the evidence of this well-observed earthquake, and those of Klotz do not seem to be appreciably nearer finality than those in use. It is, however, important to note that the real question is *not* whether Klotz's tables are better than those in use, *but* whether they show an advance sufficient to justify a change. A change is apt to cause confusion, and, in view of the large number of results already obtained with the adopted tables, a change to others could only be justified by a *considerable* gain in accuracy. It may fairly be claimed that no such great gain is indicated by the P and S residuals.

But there is another way of looking at the matter, which M. Somville explicitly mentioned. He remarked that he had found the values of T_0 deduced from $S-P$ and P , more accordant with Klotz's tables than with the adopted tables. To test this point the corrections to T_0 (δT_0) have been calculated from the above residuals in the usual way. Thus the first pair $\delta P = +1.4s.$, $\delta S = +3.5s.$, give $\delta(S-P) = +2.1s.$ Since $S-P = 0.8P$ approximately, the inferred value of δP from $\delta(S-P)$ is $+2.1s. + 0.5s. = +2.6s.$, showing that T_0 must be corrected by $+1.4s. - 2.6s. = -1.2s.$ as shown under heading δT_0 . The numbers in both these columns show a negative dip near $\Delta = 50^\circ$, the 3rd line being especially large; but the number of S observations is very small and the accidental error may be large. The recovery to positive values of δT_0 near $\Delta = 80^\circ$ is, however, much more marked for Klotz's tables, and the values of δT_0 are, in fact, much *less* accordant with his tables than with those adopted. To exhibit the matter in another way, the individual corrections δT_0 deduced from the various observatories were collected, omitting (as affected with largish accidental error in either P or S) Hokoto, Kobe, Colombo, Pompeii, Milan, Adelaide, Melbourne, Victoria, and all stations with $\Delta > 90^\circ$. The results are arranged in order of magnitude.

Individual Corrections δT_0

Adopted Tables.				Klotz's Tables.			
s.	s.	s.	s.	s.	s.	s.	s.
-20	+19	+13	+9	+33	+27	+21	+20
8	7	7	5	-19	+16	-15	+14
5	4	4	3	14	+14	+13	+11
+2	+1	+1	0	+9	-9	+9	+8
-1	-2	-2	-4	7	+7	+8	+6
-5	-6	-6	-6	5	0	0	0
-6	-8	-9	-10	-2	-3	-3	-3
-10	-10	-12	-13	-3	-5	-6	-7
-14	-14	-16	-18	-9	-9	-12	-14
-24				-14			
Mean -3s.				Mean +5s.			

Here again there is certainly no marked superiority of Klotz's tables; and the systematic differences for different values of Δ show very clearly in the wide gap between +5s. and 0s., or in the double maximum: a feature also shown by the adopted tables in less degree. There seems no good reason for discussing the Klotz residuals further. We proceed to the next question:

(2) How accurately can the Epicentre and T_0 be determined with Adopted Tables?

The above discussion shows that a correction $\delta T_0 = -3$ sec. is required to the T_0 originally adopted, making it Dec. 16d. 12h. 5m. 43sec. Using this revised value, the residuals δP and δS were converted into $\delta \Delta$ (by use of the adopted tables), and then collected according to Azimuth round the epicentre.

Groups in Azimuth were formed as follows. [A preliminary solution, including Bombay and Taihoku, showed that both these readings stood out unduly; and they were omitted from the solution below.]

Mean Az.	No. of Stations.	$\delta \Delta$	Sin Z.	Cos Z.	C.	O-C.
65	6	-0.28	-0.91 x	+0.42 y	-0.30	-0.02
108	3	-0.13	-0.95 x	-0.31 y	-0.10	-0.03
157	5	+0.20	-0.39 x	-0.92 y	+0.19	+0.01
233	2	+0.35	-0.80 x	-0.60 y	+0.33	+0.02
310	12	-0.02	-0.78 x	-0.63 y	+0.02	+0.00
317	11	-0.10	-0.68 x	-0.73 y	-0.07	-0.03

Equating the $\delta \Delta$ to an expression of the form $x \sin (Az.) + y \cos (Az.)$ we find

$$x = -0^{\circ}.20 \text{ and } y = -0^{\circ}.29.$$

and substituting these values we get the column C. The residuals O-C are smaller than might have been expected from the obvious errors of the tables. We thus obtain the corrected epicentre

$$35^{\circ}.79\text{N. } 105^{\circ}.74\text{E.,}$$

which has been adopted for use. It is not intended to claim the second decimal place as exact; but it will serve to show that the determination is probably much more accurate than usual.

(3) Is there any evidence of unusual Focal Depth?

The La Paz residual [$\div 7$] for {P} suggests that the focus was rather *above* the normal: *i.e.*, nearer the earth's surface, which might account for the destructive nature of the shock. But the observations within 90° of the epicentre do not support this view. They are well distributed in Azimuth, and for a focal height of (say) 0.10 above normal, terms would have to be added to the left side of the above six equations, which are all negative, and range from $-0^{\circ}.4$ to $-1^{\circ}.3$ in value. The solution for position of epicentre would no longer be satisfactory.

Additional Stations.

After the above discussion had been completed and prepared for Press as above, the first of the *Monographies*, which are to form Series B of the Publications of the Central Bureau at Strasbourg, was received. It contains a discussion of the geology of the region (Chap. I) of the macroseismic information (Chap. II), and in Chap. III observations of P and S are given for a number of stations. No T_0 is assigned: but the epicentre $36^{\circ}0'N$. $105^{\circ}5'E$. is adopted (justification is to follow), and the distances of the stations have been calculated from this epicentre in km. The Strasbourg list does not contain some of the observations given above, notably those from Indian and American stations. On the other hand it contains information from seventeen stations which have not up to the present sent readings to Oxford. These are given below, with their distances (in degrees and tenths) from the Oxford epicentre, and residuals as usual. They fall naturally into two groups, according either to Azimuth or to Δ .

Group I.—Japanese.

	Δ	Az.	P.	O-C.	S.	O-C.	$\delta \Delta(P)$	$\delta \Delta(S)$
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	$^{\circ}$	$^{\circ}$
Jinsen	16.8	78	3 18	-44	6 32	-41	-3.4	-1.8
Foukouoka	20.4	89	4 48	+2	8 35	+3	+0.2	+0.2
Gifu	25.2	82	5 33	-7	9 49	-18	-0.7	-0.9
Maebasi	26.9	79	6 23	+30	11 8	+29	+2.6	+1.6
Mukaiyama	28.0	74	6 13	+5	11 8	+9	+0.5	+0.5
Tyosi	28.4	80	6 4	-8	10 52	-14	-0.8	-0.8
Mean	24.3	80		-4		-5	-0.27	-0.20

The last two columns show the change of Δ required to satisfy the P or S observation exactly. But the Jinsen and Maebasi observations suggest rather an error in time determination than in Δ . If we omit them the mean values of $\delta \Delta$ are, for P, $-0^{\circ}.020$; for S $-0^{\circ}.22$. On the whole a mean value $-0^{\circ}.20$ is suggested for azimuth 80° .

Group II.—European.

				m. s.	s.	m. s.	s.		
Abisco		55.9	334	9 44	- 1	i 17 24	- 9	-0.2	-0.7
Upsala	E. {	58.7	324	9 58	- 5	i 17 55	-12	-0.7	-1.0
	N. {			e 10 0	- 3	i 17 55	-12		
Jena		65.3	316	i 10 42	- 5	i 19 36	+ 7	-0.8	+0.6
Dyce	E. {	69.0	327	e 11 13	+ 2	20 16	+ 2		
	N. {			e 11 14	+ 3	20 13	- 1	+0.4	0.0
Marseilles	E. {	72.8	318	e 11 45	+10	21 11	+11	+1.6	+0.8
	N. {			e 11 45	+10	21 8	- 8		
Clermont Ferrand	E. {	72.8	315	11 40	+ 5	20 52	- 8	+1.0	-0.5
	N. {			e 11 42	- 7	20 55	- 5		
Mean		65.8	322		- 2		- 2	+0.22	-0.13

The corrections suggested by P and S are in opposite directions, the mean of the two being only $+0^{\circ}.04$.

Now the Strasbourg position ($36^{\circ}0'N$. $105^{\circ}5'E$.) is $0^{\circ}.21N$. and $0^{\circ}.24W$. of the Oxford position ($35^{\circ}.79N$. $105^{\circ}.74E$.). Its adoption would increase Δ for the Japanese stations in mean azimuth 80° , by $0^{\circ}.2$, whereas we find that they suggest a decrease of $0^{\circ}.2$. And it would diminish the Δ for European stations in mean azimuth 322° by $0^{\circ}.3$, whereas we find a very slight increase suggested. Hence the omitted stations do not in themselves in any way favour a correction towards the Strasbourg epicentre: and their inclusion in the above discussion would clearly affect the position adopted very slightly.

It is interesting to see what epicentre can be deduced from the macroseismic curves drawn in the Monograph above referred to. Let us assume, for instance, that the epicentre O is an approximate centre of symmetry for the contour lines. At the outset we do not know the position of O, but we can make a rough guess at an approximate position and draw through it a radius, say . . . $C_2 B_2 A_2 O A_1 B_1 C_1$, . . . cutting the series of contours in $A_1 A_2$; $B_1 B_2$; $C_1 C_2$; &c. Then if O is a centre of symmetry we should have $OA_1/OA_2 = OB_1/OB_2 = OC_1/OC_2$, &c. Measure then in any unit the distances from any arbitrary zero to the points $C_2 B_2 A_2 A_1 B_1 C_1$, &c., and let them be . . . $c_2, b_2, a_2, a_1, b_1, c_1$, . . . The distance of O is, of course, unknown and to be found. Denote it by x . Then

$$\frac{x - a_2}{a_1 - x} = \frac{x - b_2}{b_1 - x} = \frac{x - c_2}{c_1 - x} = \dots = k = \frac{x - m_2}{m_1 - x}$$

where m_2 and m_1 are the means of the quantities $a_2, b_2, c_2, \dots, a_1, b_1, c_1, \dots$. The ratio k is thus represented by any one of the ratios $(a_2 - m_2)/(a_1 - m_1)$; and the best value for it is found from

$$k^2 = \frac{(a_2 - m_2)^2 + (b_2 - m_2)^2 + (c_2 - m_2)^2 + \dots}{(a_1 - m_1)^2 + (b_1 - m_1)^2 + (c_1 - m_1)^2 + \dots}$$

Having got k we can find x from each of the individual ratios and take the mean. Thus $x = a_1 + (a_2 - a_1)/(k + 1)$.

With the position of O thus found, draw a radius at right angles to the former and repeat the process. If the new position is not far from that adopted these two operations may suffice: but it may be necessary to repeat the first with a radius parallel to the original one through the corrected position of O. Applying this general procedure to the particular case before us, a radius was first drawn through latitude $35^\circ 5'$ of the large scale diagram in the Monographie at right angles to the meridian. The longitudes read off were $106^\circ 62'$, $104^\circ 90'$; $107^\circ 78'$, $104^\circ 58'$; $109^\circ 38'$, $103^\circ 89'$. [They were actually read with a scale of sixteenths of an inch, of which 21 go to the degree of longitude, and then reduced to decimals of a degree.]

$$\begin{aligned} \text{Hence } m_1 &= (106.62 + 107.78 + 109.38)/3 = 107.93 \\ m_2 &= (104.90 + 104.58 + 103.89)/3 = 104.46 \end{aligned}$$

$$k^2 = \frac{(1.31)^2 + (0.15)^2 + (1.45)^2}{(0.44)^2 + (0.12)^2 + (0.57)^2} = 7.20 = (2.68)^2$$

The three deduced values of x are

$$105^\circ 38', 105^\circ 45', 105^\circ 37'; \text{ mean } 105^\circ 40'.$$

Taking now a meridian through $105^\circ 40'$, the latitudes $36^\circ 60'$, $34^\circ 60'$; $37^\circ 21'$, $34^\circ 19'$; $38^\circ 08'$, $33^\circ 23'$ were estimated (the last pair by extrapolation). Hence $m_1 = 37^\circ 30'$, $m_2 = 34^\circ 01'$.

$$k^2 = \frac{(0.70)^2 + (0.09)^2 + (0.78)^2}{(0.59)^2 + (0.18)^2 + (0.78)^2} = 1.119 = (1.060)^2$$

The three deduced values of y are

$$35^\circ 57', 35^\circ 66', 35^\circ 58'; \text{ mean } 35^\circ 61'.$$

The three epicentres found are thus

	Lat. N.	Long. E.
Strasbourg	$36^\circ 0'$	$105^\circ 5'$
Oxford	$35^\circ 79'$	$105^\circ 74'$
Contours	$35^\circ 61'$	$105^\circ 40'$

A completely independent determination by Mr. J. S. Hughes gave

Contours (J.S.H.)	$35^\circ 57'$	$105^\circ 43'$
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As a general check on the method of contours we may compare the ratios of the segments into which the 4 radii are divided.

Contour.	Segments.		Mean of 4.	Residuals.	
	Longitude.	Latitude.		Long.	Lat.
Inner	1.22	0.50	0.99	0.93	-0.10 +0.01
Median	2.38	0.82	1.60	1.57	+0.15 -0.01
Outer	3.98	1.51	2.47	2.58	-0.32 +0.14
Means	2.53	0.94	1.69		+0.11 -0.01
Ratios	1.42	0.53	0.95		+0.11 -0.24
					-0.02 -0.46

These are given in columns 2 to 5, with means at the foot. The mean of these means is 1.78, and below them are given the ratios of each to this mean value, representing the expansion or contraction along that particular radius. In the 6th column are given the means of the 4 radii for each contour. Multiplying 0.93 by the ratio 1.42, we get 1.32, which is represented by the observation 1.22. Thus $O - C = -0.10$, as entered in the corresponding place under heading "Residuals." Some of these are large, but perhaps not more so than inspection of the contour lines would suggest. The curves are only very roughly similar.

Dec. 16d. 21h. 10m. 0s. Epicentre $13^{\circ}08'$. $166^{\circ}08'E$. (as on 1920 Dec. 7d.).

$$A = -.949, B = +.222, C = -.225; \quad D = +.228, E = +.974; \\ G = +.219, H = -.051, K = -.971.$$

A very rough determination.

	Δ	Az.	P.		O - C.	S.	O - C.	L.	M.
			m. s.	s.					
Apia	20.8	95	14 55	4	19 4	+24	19.8	—	—
Riverview	25.2	213	e 5 32	—	1 10 4	- 3	e 12.1	13.1	—
Melbourne	31.5	214	—	—	—	—	16.8	17.3	—
Honolulu	48.6	46	—	—	e 15 7	-54	24.0	32.6	—
Batavia	59.4	270	10 6	- 2	1 18 11	- 5	—	—	—
Victoria	86.9	36	—	—	—	—	41.7	44.2	—
Chicago	110.2	49	—	—	—	—	52.0	—	—
La Paz	118.1	117	e 20 25	?PR ₁	—	—	60.1	63.9	—
Hamburg	135.5	340	—	—	—	—	e 68.0	—	—
Helwan	135.6	300	23 0	?PR ₁	(36 0)	?	—	—	—
De Bilt	138.2	343	—	—	—	—	e 66.0	75.3	—
Uccle	139.6	343	—	—	—	—	e 67.0	77.0	—
Coinbra	152.5	352	—	—	—	—	e 75.0	—	—
Rio Tinto	154.5	348	91 0	?L	—	—	(91.0)	105.0	—
San Fernando N.	155.7	346	24 0	?PR ₁	—	—	—	94.5	—

Additional readings: Riverview gives also $MZ = +14.2m$. Chicago $L = +70.0m$. De Bilt $ePR_1 = +23m.6s.$, $MN = +79.6m.$, $T_0 = 21h.9m.50s$. Barcelona gives 21h. approximately.

Dec. 16d. Readings also at 0h. (Mobile and Algiers), 4h. (near La Paz), 5h. (Taihoku), 6h. (Taihoku and Zi-ka-wei), 8h. (Zi-ka-wei (2) and Taihoku (6)), 9h. (Zi-ka-wei and Taihoku), 11h. (Apia), 14h. (La Paz), 17h. (La Paz, De Bilt, and Algiers), 19h. (near Taihoku (2)), 20h. (De Bilt, Helwan, and Uccle), 23h. (La Paz).

Dec. 17d. 3h. 38m. 28s. Epicentre $22^{\circ}0'N$. $123^{\circ}5'E$. (as on 1918 April 1d.).

$$A = -.512, B = +.773, C = +.375; \quad D = +.834, E = +.552; \\ G = -.207, H = +.312, K = -.927.$$

	Δ	Az.	P.		O - C.	S.	O - C.	L.	M.
			m. s.	s.					
Taihoku	3.5	330	e 1 13	+18	—	—	2.3	2.5	—
Hokoto	4.0	293	0 58	- 4	—	—	1.3	—	—
Manila	7.8	198	e 1 40	-18	—	—	—	—	—
Zi-ka-wei	9.4	348	e 2 22	0	e 4 14	+ 1	—	4.9	—
Helwan	81.0	299	49 32	?L	—	—	(49.5)	—	—
De Bilt	88.6	328	—	—	—	—	e 50.5	—	—

Helwan gives also $PE = +51m.32s$.

Dec. 17d. 18h. 59m. 49s. Epicentre $33^{\circ}08' 68^{\circ}6W$. (suggested by La Paz and De Bilt).

A = +306, B = -781, C = -545; D = -931, E = -365;

G = -199, H = +507, K = -839.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	E.	16.5	2	i 4 0	+ 1	—	—	9.0	10.4
	N.	16.5	2	—	—	i 7 10	+ 3	9.1	12.6
Tacubaya	N.	60.0	327	10 13	+ 1	18 23	0	30.0	—
Georgetown	E.	72.4	354	e 11 31	- 1	20 54	- 1	—	—
	N.	72.4	354	e 11 31	- 1	20 49	- 6	e 40.3	—
Washington		72.4	354	11 14	-18	20 43	-12	e 39.2	—
Ann Arbor	E.	76.6	350	10 11	-108	23 11	+87	38.3	—
	N.	76.6	350	10 23	-96	22 23	+39	38.6	—
Chicago		76.8	346	11 0	-60	21 11	-36	38.2	—
Toronto		77.3	353	—	—	—	—	e 36.1	53.5
Ottawa	E.	78.7	356	—	—	e 21 1	-67	e 39.2	—
Wellington		85.6	223	e 12 59	+ 8	e 23 59	+33	e 48.2	—
Berkeley		86.8	321	—	—	—	—	e 47.2	—
San Fernando		90.7	45	22 11	?S	(22 11)	-130	—	61.7
Rio Tinto		91.3	44	23 11	?S	(23 11)	-76	—	69.2
Coimbra		91.9	41	—	—	23 45	-49	e 39.7	54.2
Algiers		93.7	50	24 58	?S	(24 58)	-25	48.2	54.7
Tortosa		97.4	45	—	—	—	—	e 36.2	62.2
Barcelona		98.8	46	—	—	—	—	46.6	54.4
Honolulu		101.0	289	—	—	25 59	- 6	53.2	56.0
Melbourne		102.6	207	—	—	—	—	e 52.2	57.2
Oxford		103.1	37	—	—	e 24 8	-137	33.0	57.8
Paris		103.4	40	—	—	i 28 27	+119	48.2	56.2
Kew		103.5	37	—	—	—	—	—	68.2
Stonyhurst		103.9	36	24 47	?S	(24 47)	-105	—	61.2
Moncalieri		104.2	45	—	—	—	—	40.4	67.1
Edinburgh		104.8	33	—	—	27 51	+71	51.2	61.9
Uccle		105.5	40	e 18 29	?PR ₁	e 27 59	+72	e 49.2	57.0
Rocca di Papa	N.	105.5	50	e 18 53	?PR ₁	e 26 23	-24	e 54.6	70.1
Florence		105.7	47	49 11	?L	—	—	(49.2)	81.2
Strasbourg		106.1	41	—	—	—	—	e 50.2	58.2
Pompeii	E.	106.2	51	28 11	?S	(28 11)	+77	—	—
De Bilt		106.6	38	—	—	e 28 7	+70	e 49.2	59.6
Hamburg		109.8	37	e 17 11	+135	—	—	—	66.2
Athens		110.9	57	—	—	—	—	e 62.2	—
Vienna	Z.	111.0	44	e 19 7	?PR ₁	—	—	—	—
Helwan	E.	113.3	70	20 17	?PR ₁	—	—	—	73.3
	N.	113.3	70	21 5	?PR ₁	—	—	—	62.4
Batavia		140.6	172	e 22 57	?PR ₁	—	—	—	—
Colombo		140.8	125	75 11	?L	—	—	83.2	85.2
Kodaikanal		141.3	119	76 23	?L	—	—	79.9	81.5

Additional readings: La Paz gives also $PR_1 = +4m.8s.$, $SR_1 = +7m.34s.$, $SR_2 = +8m.5s.$, $T_0 = 18h.59m.50s.$ Epicentre $33^{\circ}08' 68^{\circ}6W$. Georgetown $eLN = +43.6m.$, $T_0 = 19h.0m.1s.$ Washington $L = +42.2m.$, $T_0 = 18h.59m.33s.$ Chicago $L = +50.2m.$, $T_0 = 18h.58m.36s.$ Toronto $L = +45.4m.$, $eL = +50.3m.$, $L = +52.6m.$ and $+59.5m.$ Ottawa $LN = +48.5m.$, $L = +60.2m.$ Wellington gives its readings as e's. In addition to those given above we have $e = +16m.41s.$, $+29m.53s.$, $+34m.47s.$ and $36m.47s.$ Barcelona $MN = +52.5m.$ Honolulu $e = +43m.41s.$ Paris $MN = +51.2m.$ Moncalieri $MN = +55.5m.$ Uccle $SR_1 = +33m.41s.$ Strasbourg $eL = +53.2m.$ Pompeii reading is given one hour late. De Bilt $e = +25m.16s.$, $MN = +52.2m.$ Batavia $i = +23m.16s.$

Dec. 17d. Readings also at 2h. (La Paz (2) and Zi-ka-wei), 8h. (San Fernando), 9h. (Batavia), 11h. (La Paz and Colombo), 12h. (Dehra Dun), 16h. and 17h. (near Athens), 19h. (La Paz), 20h. (Rocca di Papa, De Bilt, Athens, and Vienna), 21h. (La Paz), 22h. (near Mizusawa).

Dec. 18d. 2h. 1m. 20s. Epicentre 40°0'N. 20°0'E. (as on 1920 Nov. 29d.).

$$A = +.720, B = +.262, C = +.643; \quad D = +.342, E = -.940; \\ G = +.604, H = +.220, K = -.766.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Athens	E.	3.6	123	e 1 18	+22	e 2 6	+27	e 2.2	3.3
	N.	3.6	123	e 1 13	+17			—	3.2
Pompeii		4.2	281	i 1 27	+22	1 57	+ 2	—	4.2
Rocca di Papa		5.8	291	i 1 34	+ 4	—	—	(2.9)	4.4
Florence		7.5	303	2 2	+ 8	(3 30)	+ 6	—	5.2
Padova		8.0	315	(2 13)	+12	2 13	?P	—	—
Vienna		8.6	344	2 4	- 6	—	—	i 4.5	4.9
Lemberg		10.2	15	—	—	—	—	e 5.2	5.6
Moncalieri		10.3	303	e 3 2	+28	5 1	+24	5.7	9.0
Zurich		11.0	316	e 2 41	- 3	4 51	- 3	—	—
Strasbourg		12.2	318	e 2 55	- 7	5 30	+ 6	6.7	7.4
Besançon		12.4	310	5 1	?S	(5 1)	-28	(7.1)	7.7
Barcelona		13.6	288	—	—	—	—	7.8	9.7
Helwan	N.	13.7	134	8 40	?L	—	—	(8.7)	—
Tortosa		14.8	279	—	—	—	—	8.4	10.8
Hamburg		15.2	337	—	—	—	—	e 7.7	—
Paris		15.2	311	—	—	e 7 56	?L	8.7	11.7
Uccle		15.3	320	e 3 46	+ 3	—	—	e 7.7	—
De Bilt		15.8	325	—	—	—	—	e 7.6	11.9
Kew		18.1	316	—	—	—	—	—	13.7
Oxford		18.8	316	—	—	7 53	- 5	10.1	12.1
Stonyhurst		20.5	320	8 40	?S	(8 40)	+ 6	—	13.2
Rio Tinto		20.8	272	17 40	?	—	—	—	22.7
Coimbra		21.7	280	e 5 10	+ 9	9 8	+ 9	e 12.2	13.8
Edinburgh		22.0	324	—	—	—	—	11.7	—

Additional readings: Rocca di Papa gives also iPN = +1m.46s., L is given as
 PR₁. Lemberg e = +5m.28s. Moncalieri MN = +8.4m. Stras-
 bourg MZ = +6.9m., MN = +7.0m. De Bilt MN = +9.4m.

Dec. 18d. 10h. 3m. 40s. Epicentre 0°5'N. 126°5'E.

$$A = -.595, B = +.804, C = +.009; \quad D = +.804, E = +.595; \\ G = -.005, H = +.007, K = -1.000.$$

A depth 0.020 of focus below normal is assumed.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Manila	-0.5	15.1	339	e 3 34	0	6 17	- 5	7.0	9.0
Batavia	-0.8	20.7	251	4 40	0	—	—	14.7	15.1
Zi-ka-wei	-1.4	31.1	352	e 5 59	-26	—	—	—	—
Adelaide	-1.6	37.2	164	—	—	i 13 2	- 2	i 17.6	24.1
Riverview	-1.8	41.5	149	e 7 59	+ 7	e 14 20	+18	e 24.5	30.5
Sydney	-1.8	41.5	149	7 50	- 2	—	—	25.3	30.3
Kodaikanal	-2.1	49.7	282	30 26	?L	—	—	(30.4)	—
Wellington	-2.4	60.4	140	—	—	—	—	e 31.3	—
Honolulu	-2.6	76.3	69	e 13 8	+88	e 22 38	+88	36.7	45.2
Helwan	-2.8	94.2	300	24 20	?S	(24 20)	- 8	—	—
De Bilt	—	108.2	326	—	—	—	—	e 56.3	63.5
Paris	—	111.2	323	—	—	—	—	64.3	—
La Paz	—	158.5	139	19 35	[-31]	22 33	?PR ₁	24.3	24.9

Additional readings: Manila gives also MN = +8.1m., T₀ = 10h.3m.53s.
 Batavia i = +5m.27s. and +8m.58s. Adelaide e = +21m.20s. and
 +23m.20s., e = +39m.38s., +43m.8s., and +44m.38s. Riverview eSR₁? =
 +17m.16s., MN = +28.5m., T₀ = 10h.3m.37s. Wellington e = +15m.32s.,
 +25m.56s., +32m.38s., and +39m.44s. Helwan PE = +23m.20s. De
 Bilt e = +41m.50s., MN = +63.2m.

Dec. 18d. Readings also at 0h. (De Bilt and La Paz), 1h. (San Fernando), 5h.
 (La Paz and Taihoku (2)), 7h. (La Paz), 9h. (Barcelona), 10h. (River-
 view), 15h. (2) and 16h. (La Paz), 19h. (Taihoku), 21h. (San Fernando),
 22h. (Zi-ka-wei, Taihoku, Osaka, near Nagasaki, and near Athens), 23h.
 (La Paz).

Dec. 19d. 20h. 10m. 45s. Epicentre $38^{\circ}3'N$. $141^{\circ}0'E$.

A = -610, B = +494, C = +620; D = +629, E = +777;
 G = -482, H = +390, K = -785.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	0.8	6	0 34	+22	0 56	+34	—	—
Tokyo		2.8	201	0 29	-15	—	—	0.9	1.0
Sapporo		4.8	2	1 56	+42	2 53	+42	3.2	—
Osaka		5.8	233	1 25	-5	—	—	3.0	4.1
Kobe	E.	5.9	234	1 30	-1	2 36	-5	3.0	4.1
	N.	5.9	234	1 33	+2	2 41	0	2.9	3.3
Ootomari		8.5	8	1 48	-21	(3 30)	-20	3.5	6.9
Nagasaki		10.6	242	2 40	+2	—	—	e 5.1	—
Zi-ka-wei		17.5	252	e 4 10	-1	e 7 48	+19	—	—
Taihoku		21.1	237	—	—	e 8 37	-9	12.2	—
Manila		29.6	222	e 6 34	+10	10 32	-55	12.1	13.8
Honolulu		54.5	89	e 11 15	+99	i 17 45	+30	e 25.2	45.6
Batavia		54.6	224	e 9 32	-5	i 17 4	-12	—	17.5
Kodaikanal		63.0	263	39 39	?L	—	—	(39.6)	—
Riverview		72.8	171	e 20 33	?S	(e 20 33)	-27	e 34.1	38.4
Hamburg		78.9	333	e 12 12	0	—	—	e 44.2	—
Vienna		80.5	327	12 21	-1	—	—	—	54.8
De Bilt	E.	81.8	334	—	—	22 50	-6	e 41.2	46.8
	N.	81.8	334	—	—	—	—	e 42.2	52.6
Stonyhurst		82.6	339	—	—	—	—	—	54.8
Uccle		83.1	334	e 12 35	-2	e 22 57	-1	e 41.2	44.2
Strasbourg		83.8	330	—	—	—	—	e 47.2	—
Kew		84.1	339	—	—	—	—	—	55.2
Wellington		85.4	155	—	—	—	—	e 41.2	—
Paris		85.5	334	—	—	—	—	e 45.2	46.2
Helwan		85.5	305	22 15	?S	(22 15)	-70	—	—
Moncalieri		86.7	330	—	—	—	—	47.1	—
Rocca di Papa		87.2	324	—	—	—	—	e 53.2	56.8
Tortosa		93.1	331	—	—	—	—	e 52.2	61.3
Coimbra		96.7	338	—	—	e 23 15	-128	53.2	63.5
Rio Tinto		98.3	335	59 15	?L	—	—	(59.2)	69.2
San Fernando		99.4	334	23 15	?S	(23 15)	-155	—	65.2
La Paz		146.4	56	i 19 49	[-1]	—	—	71.2	81.8

Additional readings and notes: Mizusawa gives PN = +30s. Taihoku
 readings have been increased by 10min. Riverview gives also MN =
 +41.4m. Stonyhurst P = 20h.6m.42s. Paris MN = +51.2m. San
 Fernando MN = +67.8m. La Paz L = +76.6m.

Dec. 19d. Readings also at 0h. (San Fernando), 1h. (Apia), 3h. (Adelaide, Riverview, La Paz, and Wellington), 4h. (La Paz and Riverview), 8h. (La Paz), 9h. (San Fernando), 11h. (Taihoku), 15h. (near Nagasaki), 23h. (near Tokyo).

Dec. 20d. Readings at 0h. (San Fernando), 1h. (near La Paz), 4h. (Nagasaki), 5h. (La Paz), 11h. (Florence), 14h. (Tucson), 15h. and 16h. (La Paz), 19h. (near Athens (2)), 22h. (Helwan).

Dec. 21d. Readings at 0h. (San Fernando), 1h. (Adelaide), 4h. (Taihoku, Vienna, and Zi-ka-wei), 5h. (Helwan and near Batavia), 6h. (Zi-ka-wei), 8h. (near Athens), 19h. (near Lick (2) and Berkeley), 20h. (near Mizusawa), 21h. (Zi-ka-wei (3) and Nagasaki), 22h. (Helwan).

Dec. 22d. Readings at 1h. (La Paz), 3h. (Zi-ka-wei), 4h. (Lick), 5h. (near La Paz (2)), 6h. (Batavia), 14h. (near Capetown), 22h. (San Fernando, Batavia, and near Vienna).

Dec. 23d. Readings at 1h. (Helwan), 2h. (Apia and Florence), 5h. (Zi-ka-wei and Helwan), 21h. (San Fernando and Lick).

Dec. 24d. Readings at 0h. (La Paz), 13h. (Algiers), 17h. (La Paz, Riverview, and near Batavia), 18h. (Helwan), 19h. (La Paz), 21h. (near Osaka and Nagasaki), 22h. (San Fernando and Riverview).

1920. Dec. 25d. 11h. 33m. 8s. Epicentre 35°-79N. 105°-74E.

(as on 1920 Dec. 16d.).

A = -219, B = +781, C = +585; D = +963, E = +271;

G = -158, H = +563, K = -811.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Zi-ka-wei	13-9	103	i 3 42	+17	e 6 43	+37	e 7-2	9-1
Hokoto	17-1	131	e 5 16	+70	—	—	10-1	11-2
Taihoku	17-4	122	i 4 25	+15	i 7 58	+31	10-2	11-9
Calcutta	E. 20-1	233	4 58	+16	8 46	+21	12-1	13-9
	N. 20-1	233	4 58	+16	8 46	+21	12-5	13-8
Nagasaki	20-2	91	4 55	+12	8 52	+25	10-7	14-1
Dehra Dun	23-8	265	6 22	+56	—	—	—	—
Kobe	E. 24-0	83	5 29	+1	10 46	+62	13-9	—
Simla	24-2	268	6 22	+52	10 52	+64	14-4	17-3
Osaka	24-4	83	5 31	-1	9 48	-4	13-3	16-1
Manila	25-2	142	e 5 52	+12	9 54	-13	15-6	16-1
Tokyo	27-6	80	5 31	-33	10 25	-27	14-3	17-1
Mizusawa	N. 28-1	72	6 10	+1	11 24	+23	—	—
Ootomari	29-7	57	6 9	-16	(10 48)	-41	10-8	11-9
Bombay	33-4	248	6 35	-25	—	—	—	20-9
Kodaikanal	36-2	232	6 10	-74	—	—	12-1	26-2
Colombo	37-3	226	—	—	12 52	-36	19-9	25-9
Batavia	42-0	178	i 8 13	+2	i 14 39	+4	—	25-0
Lemberg	58-4	312	e 9 58	-3	—	e 24-2	39-0	—
Helwan	E. 61-3	288	10 40	+19	—	—	—	40-7
	N. 61-3	288	11 28	+67	—	—	—	38-9
Seychelles	61-8	241	7 52	?	—	—	34-9	36-9
Vienna	63-7	312	i 10 35	-1	19 10	+1	e 29-6	35-9
Hamburg	E. 65-0	319	—	—	e 19 28	+3	—	34-8
	N. 65-0	319	—	—	e 19 25	0	—	35-5
	Z. 65-0	319	e 10 45	0	—	e 29-9	35-6	—
Padova	67-8	311	11 3	0	19 57	-3	—	—
Perth	68-4	171	27 52	?L	—	—	(27-9)	—
Pompeii	E. 68-3	305	i 11 9	+3	i 20 8	+2	26-9	53-9
De Bilt	68-3	320	11 9	+3	20 5	-1	e 33-9	42-2
Strasbourg	68-7	315	e 11 7	-2	—	—	e 33-9	44-3
Zurich	68-8	314	e 11 7	-3	—	—	e 34-4	—
Florence	68-9	310	11 16	+6	19 52	-21	—	—
Rocca di Papa	E. 69-1	308	i 11 10	-2	e 20 10	-5	e 33-0	42-4
	N. 69-1	308	e 11 14	+2	e 20 16	+1	—	51-9
Uccle	69-3	318	i 11 14	+1	20 15	-3	e 33-9	41-4
Edinburgh	70-3	326	—	—	—	—	—	39-9
Besançon	70-3	316	11 21	+2	17 53?	?	37-9	—
Moncalieri	70-5	312	11 15	-5	26 20	?SR ₁	36-5	44-0
Stonyhurst	71-2	323	25 4	?SR ₁	28 40	?	37-8	41-9
Paris	71-4	318	e 11 26	0	e 20 56	+13	37-9	44-9
Kew	71-4	321	27 52	?L	—	—	(27-9)	53-9
Oxford	71-8	321	—	—	—	—	33-5	47-3
Barcelona	75-8	311	11 52	-2	—	e 40-6	48-9	—
Adelaide	77-1	151	—	—	—	—	—	54-9
Tortosa	77-2	312	11 59	-3	21 44	-7	33-8	61-7
Algiers	78-0	307	12 4	-3	21 55	-5	e 30-9	49-9
Riverview	81-6	143	e 12 32	+4	e 22 51	+9	e 46-4	64-5
Melbourne	82-1	150	—	—	43 28	?L	47-5	58-4
Granada	82-1	311	12 19	-12	22 31	-16	—	—
Honolulu	82-5	69	e 12 22	-11	e 27 57	?SR ₁	46-9	59-5
Coimbra	E. 82-9	315	12 30	-5	22 47	-9	e 40-9	50-9
Rio Tinto	83-4	313	16 52	?	—	—	—	58-9
San Fernando	84-0	311	12 34	-8	23 24	+16	45-3	48-6
Victoria	85-2	30	—	—	22 35	-46	29-5	55-3
Berkeley	94-0	36	—	—	—	e 51-9	—	—
Lick	94-7	36	—	—	—	e 54-5	—	—
Ottawa	98-8	1	—	—	e 29 52	+248	47-4	—
Wellington	99-7	135	e 18 40	?PR ₁	e 23 40	-133	—	—
Toronto	100-5	3	—	—	—	e 49-7	67-5	—
Ann Arbor	101-4	6	—	—	—	—	55-6	—
Chicago	101-5	9	18 2	?PR ₁	25 24	-46	e 56-9	—
Ithaca	101-7	1	—	—	—	—	60-9	—
Georgetown	105-3	2	—	—	—	—	54-1	—
Washington	105-3	2	e 20 22	?PR ₁	25 52	-53	e 52-9	—
Cape Town	107-1	240	19 15	?PR ₁	—	—	—	62-6
La Paz	160-0	342	i 20 14	[+ 6]	33 49	?	78-9	106-6

For Notes see next page.

NOTES TO DEC. 25d. 11h. 33m. 8s.

Additional readings and notes: Zi-ka-wei gives also MN = +8.3m., T_0 = 11h.33m.5s. Dehra Dun gives its reading as on 26d. Kobe 30m. have been deducted from these readings. Osaka MN = +14.3m., T_0 = 11h.33m.16s. Manila MN = +15.8m. Mizusawa SE = +10m.36s., T_0 = 11h.33m.44s. Ootomari MN = +18.5m. Kodaikanal P has been increased by 10m. Batavia i = +11m.0s., +16m.8s., and 24m.12s., T_0 = 11h.33m.13s. Vienna iSE = +19m.11s., i = +33m.57s., MN = +36.7m. Hamburg iPZ = +10m.47s., T_0 = 11h.33m.14s. De Bilt eN = +20m.41s., MN = -38.2, T_0 = 11h.33m.21s. Strasbourg e = +11m.8s., i = +13m.39s., e = +17m.46s., i = +17m.55s., MN = +39.0m. Rocca di Papa iSN = +20m.52s. Uccle MN = +45.1m., T_0 = 11h.33m.21s. Moncalieri MN = +43.9m. Paris MN = +39.9m., T_0 = 11h.33m.3s. Algiers PR₁ = +14m.55s., T_0 = 11h.33m.19s. Riverview MN = +50.3m., T_0 = 11h.33m.19s. Honolulu e = -34m.52s. Coimbra SN = +22m.55s., MN = +54.4m., T_0 = 11h.33m.19s. San Fernando MN = +54.4m., T_0 = 11h.32m.51s. Victoria i = -48m.14s. and -57m.38s. Ottawa eL = +44.4m., L = +56.9m. Toronto i = +54m.16s., iL = +56.4m., and -58.4m., eL = +62.2m. and -86.8m. Chicago L = +66.9m. Georgetown LN = +56.9m.

Dec. 25d. Readings also at 7h. (Zi-ka-wei, Vienna, and Taihoku), 8h. (La Paz), 17h. (Helwan), 22h. (near Tacubaya and Oaxaca).

Dec. 26d. Readings at 1h. and 2h. (2) (La Paz), 6h. (Taihoku), 7h. (Algiers), 8h. (Taihoku), 10h. (Vienna and near Rocca di Papa), 19h. (La Paz), 20h. (Wellington, Zi-ka-wei, Stonyhurst, Rio Tinto, De Bilt, La Paz, and Helwan), 22h. (La Paz), 23h. (La Paz and Helwan).

Dec. 27d. 9h. 20m. 20s. Epicentre 33° 2'N. 138° 0'E. (as on 1919 May 31d.).

$$A = -.622, B = +.560, C = +.548.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
		m. s.	s.	m. s.	s.	m.	m.
Osaka	2.6	0 44	+ 3	—	—	2.6	3.4
Kobe	2.8	1 40	?L	—	—	(1.7)	—
Tokyo	2.8	c 1 6	+22	—	—	—	1.4
Mizusawa	E. 6.4	1 35	- 3	2 54	- 1	—	—
Zi-ka-wei	14.2	c 4 40	+71	—	—	—	—

Additional readings: Osaka gives also MN = +3.6m. Mizusawa PN = +1m.49s.

Dec. 27d. 16h. 19m. 0s. Epicentre 43° 8'N. 11° 2'E. (Florence) (as on 1920 Nov. 13).

$$A = -.708, B = -.140, C = -.692; \quad D = +.194, E = -.981; \\ G = -.679, H = -.134, K = -.722.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 5	+ 5	—	—	—	0.4
Padova	1.7	17	0 20	- 6	0 40	- 8	—	—
Rocca di Papa	2.3	152	c 0 48	+12	—	—	(e 1.6)	1.9
Zurich	E. 4.0	332	c 1 2	0	1 1 41	- 9	—	—
	N. 4.0	332	c 0 56	- 6	1 1 38	-12	—	—
Vienna	Z. 5.7	37	2 57	?L	—	—	(3.0)	—

No additional readings.

Dec. 27d. Readings also at 2h. (Apia), 3h. (La Paz), 8h., 9h. (2), and 11h. (Tokyo), 12h. (Helwan), 14h. (Manila and near Tokyo), 15h. (La Paz), 17h. (Algiers), 20h. (La Paz).

Dec. 28d. 3h. 16m. 30s. Epicentre $35^{\circ}5'N$. $104^{\circ}0'E$.

$$A = -197, B = +790, C = +581; \quad D = +970, E = +242; \\ G = -140, H = +564, K = -814.$$

The shock appears to be connected with that of Dec. 16d., but the above variation from the epicentre is very definitely indicated.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Zi-ka-wei		15.1	102	e 3 36	—	e 6 36	+ 2	—	8.7
Taihoku		18.4	120	—	—	—	—	e 9.7	—
Calcutta	E.	18.8	231	4 54	+27	8 42	-16	11.8	—
	N.	18.8	231	4 54	+27	8 30	-28	11.7	—
Osaka		25.6	83	e 13 16	?L	—	—	(e 13.3)	16.0
Manila		25.9	140	e 5 56	+ 9	11 12	+52	14.8	16.0
Batavia		41.8	176	i 8 4	- 5	14 2	-30	e 27.5	—
Helwan		60.1	286	31 30	?L	—	—	(31.5)	—
Vienna		62.9	313	i 10 29	- 2	—	—	e 32.5	37.0
Hamburg	Z.	64.3	320	e 10 38	- 2	—	—	—	34.5
De Bilt		67.6	320	11 6	+ 4	e 19 59	+ 2	e 34.5	37.0
Strasbourg		67.9	315	e 11 30	+27	—	—	e 35.5	—
Rocca di Papa		68.1	307	e 11 0	- 5	—	—	—	11.5
Uccle		68.7	319	e 11 5	- 4	—	—	e 34.5	—
Edinburgh		69.8	325	—	—	—	—	—	39.5
Paris		70.7	317	—	—	—	—	36.5	—
Oxford		71.2	321	—	—	—	—	38.0	45.5
Rio Tinto		82.6	313	48 30	?L	—	—	(48.5)	53.5
La Paz		159.7	338	20 10	[+ 2]	—	—	—	—

Additional readings and notes: Osaka gives MN = +15.8m. Manila MN = +15.7m. Batavia S? has been corrected by -10m. Helwan PE = +40m.30s. Rocca di Papa iPE = +11m.4s. and iPN = +11m.8s.

Dec. 28d. 5h. 27m. 12s. Epicentre $38^{\circ}5'N$. $142^{\circ}5'E$. (as on 1918 Dec. 22d.).

$$A = -621, B = +476, C = +623.$$

		Δ	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	N.	1.2	1 29	?L	2 53	?	(1.5)	—
Tokyo		3.6	0 46	-10	—	—	1.2	1.3
Nagoya		5.6	1 16	-11	—	—	—	—
Osaka		6.8	1 52	+ 8	—	—	3.2	4.2
Kobe	E.	7.1	2 13	+25	3 5	- 8	3.5	4.3
	N.	7.1	2 14	+26	2 59	-14	3.5	3.7
Zi-ka-wei		18.7	e 4 30	+ 5	—	—	—	—
De Bilt		82.1	—	—	—	—	e 45.8	56.3
La Paz		145.3	20 14	[+25]	—	—	—	—

Osaka gives MN = +4.5m.

Dec. 28d. Readings also at 1h. (La Paz), 2h. (near Mizusawa), 3h. (La Paz), 4h. (Tacubaya and San Fernando), 5h. (La Paz), 7h. (Lick), 15h. (Point Loma), 20h. (San Fernando).

Dec. 29d. Readings at 7h. (La Paz), 10h. (near Tokyo), 11h. (Apia), 13h. (Helwan), 14h. (La Paz), 15h. (Point Loma), 16h. and 17h. (La Paz), 21h. (San Fernando), 22h. (near Tokyo).

Dec. 30d. Readings at 0h. (Manila), 2h. (La Paz and near Tokyo and Mizusawa), 9h. (Stonyhurst), 12h. (Taihoku), 15h. (Point Loma), 16h. (Batavia), 17h. (near Tokyo and Mizusawa), 18h. (Rocca di Papa and near Tokyo and Mizusawa), 19h. (Apia and near Tokyo).

Dec. 31d. Readings at 2h. (San Fernando), 10h. (Melbourne, Riverview, and Wellington), 11h. (Helwan), 15h. (Point Loma and near Mizusawa), 21h. (Denver).

The present number of the Summary deals with 61 epicentres, 31 of which are new and 30 are repetitions from old epicentres. There are five cases of abnormal focus, all in March :

Date. d. h.	Epicentre.	Focus.
Mar. 4 12	29°0N. 139°0E.	+·060
Mar. 6 7	26°5N. 109°0W.	—·020
Mar. 23 22	5°5S. 130°0E.	+·060 ?
Mar. 24 1	5°5S. 130°0E.	+·060 ?
Mar. 30 15	7°6S. 128°3E.	+·040

The sign + means below normal, — above. The unit is the earth's radius.

Attention may also be called to the small Japanese shock on Jan. 9d. 18h. It seems possible that it reached La Paz in the form of [P], though intermediate readings fail, except L for De Bilt. If so the large residual (—61s.) indicates a very deep focus, which there are no other means of checking. Other cases have been noticed where [P] waves seem to be received near the antipodes of the epicentre, though not much is noticed at intermediate stations. The point seems worthy of special attention.

At the Madrid meeting of the International Union it was suggested that "where possible it should be noted whether a wave was condensational or dilatational, by adding the letter C or D to the readings" (see Introd. to Summary for 1920 July, Aug., Sept., p. 101). But such cases are apparently rare: None were found in the readings of De Bilt, Strasbourg, and Uccle for the months treated below. Enquiry is being made as to a possible misunderstanding.

The name of the Observatory at Vieques was changed in August 1920 to Porto Rico Observatory; and this change has been followed in the Summary.

H. H. TURNER.

University Observatory, Oxford.
1925 March 25.

P.S.—A few days after sending the above to press a letter was received from Mr. Jodo Horikawa from Hakodate, dated Feb. 17, giving the news that his aunt, Mrs. Milne, died at Hakodate on Jan. 30, after a long illness.

1921 JANUARY, FEBRUARY, & MARCH.

Jan. 1d. 10h. 59m. 13s. Epicentre $45^{\circ}0'N$. $16^{\circ}0'E$. (as on 1920 July 30d.). $A = +.680$, $B = +.195$, $C = +.707$.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Padova	2.9	0 49	+ 4	1 26	+ 6	—	2.1
Florence	3.6	0 54	- 2	—	—	—	1.1
Rocca di Papa	4.0	2 17	?L	—	—	(2.3)	2.8
Zurich	5.6	e 1 40	+13	—	—	—	—

Zurich gives also $eV = +1m.35s.$ and $iE = +1m.57s.$

Jan. 1d. Readings also at 0h. (San Fernando and Taihoku), 5h. (Vienna and Algiers), 7h. (near Oaxaca), 8h. (Victoria and near Tacubaya (2)), 11h. and 18h. (Apia), 13h. (near Tacubaya), 20h. (La Paz), 22h. (Helwan).

1921. Jan. 2d. 7h. 6m. 20s. Epicentre $43^{\circ}5'N$. $153^{\circ}0'E$.

(As on 1915 June 27d.).

 $A = -.646$, $B = +.329$, $C = +.688$; $D = +.454$, $E = +.891$; $G = -.613$, $H = +.312$, $K = -.725$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	7.9	297	1 58	- 2	—	—	2.8	3.8
Hakodate	9.2	263	2 16	- 3	(3 41)	-27	3.7	4.9
Mizusawa	E. 9.9	248	2 18	-11	3 49	-37	—	—
	N. 9.9	248	—	—	3 53	-33	—	—
Mito	11.9	237	2 52	- 6	(4 40)	-37	4.7	6.9
Tokyo	12.9	237	2 50	-22	3 50	-112	5.0	6.9
Nagoya	14.9	241	3 30	- 8	(6 15)	-15	6.2	6.9
Osaka	16.2	243	4 48	+53	—	—	7.8	8.9
Kobe	16.4	243	3 48	- 9	6 49	-15	8.1	—
Taihoku	31.6	244	—	—	—	—	12.1	—
Manila	39.8	233	e 5 42	-131	9 53	-250	11.6	11.7
Victoria	55.4	53	-0 12	?	6 41	?	17.0	29.8
Simla	59.5	286	—	—	18 46	+29	—	—
Batavia	64.8	233	e 10 40	- 4	i 19 17	- 6	—	—
Hamburg	77.9	339	i 12 6	0	e 22 31	+32	e 44.7	—
Edinburgh	78.6	347	—	—	—	—	—	49.7
Eskdalemuir	79.1	346	—	—	e 22 19	+ 6	39.3	—
Stonyhurst	80.5	346	22 28	?S	(22 28)	- 1	—	51.7
De Bilt	80.4	341	12 56	+35	22 19	- 9	40.7	45.1
Ann Arbor	80.2	39	25 46	?	—	—	—	—
Vienna	Z. 80.6	333	i 12 21	-2	22 31	+ 1	—	51.7
Toronto	81.1	35	—	—	e 25 22	+166	49.0	58.0
Uccle	81.8	341	12 27	- 2	e 22 19	-25	e 40.7	48.5
Ottawa	81.1	32	—	—	e 22 40	+ 4	e 44.9	—
Oxford	82.2	344	—	—	i 22 38	-10	i 49.8	—
Kew	82.3	344	—	—	—	—	—	51.7
Strasbourg	83.0	338	11 32	-64	e 21 57	-60	e 43.7	—
Paris	84.2	341	e 12 42	- 1	e 23 1	- 9	45.7	51.6
Besançon	84.7	338	12 44	- 2	—	—	42.7	—
Padova	84.8	335	12 40	- 7	15 50	?PR ₁	—	17.7
Harvard	85.5	31	—	—	—	—	45.3	—
Washington	85.9	37	—	—	e 23 20	- 9	—	—
Georgetown	85.9	37	—	—	e 23 23	- 6	—	—
Florence	86.3	333	12 55	0	—	—	—	52.6
Moncalieri	86.4	336	e 11 56	-59	(22 54)	-40	22.9	57.2
Rocca di Papa	87.6	331	i 12 52	-11	23 40	- 8	e 50.5	56.0
Pompeii	87.7	330	12 58	- 5	23 28	-21	—	—
Tortosa	91.4	340	13 17	- 6	—	—	e 45.7	53.5
Algiers	95.2	336	e 13 32	-12	e 24 58	-10	—	—
San Fernando	97.8	343	8 40	?	—	—	—	61.7
La Paz	136.0	65	i 19 38	[+ 6]	31 56	?	64.7	68.1

For Notes see next page.

NOTES TO JAN. 2d. 7h. 6m. 20s.

Additional readings: Hakodate gives also MN = +3.8m. Tokyo MN = +7.5m. Osaka MN = +8.6m. Kobe LN = +7.3m. Eskdalemuir e = +27m.28s., L = +49.3m. De Bilt LN = +43.7m., MN = +45.8m. Epicentre 43° 2N. 148° 5E. Ann Arbor PN = +26m.10s. Vienna iPEN = +12m.20s. Toronto L = +54.4m. and +57.3m. Uccle SR₁N = +28m.34s. Ottawa eE? = +32m.40s., eE = +39m.0s. Strasbourg i = +11m.33s. Harvard L = +53.4m. San Fernando MN = +60.2m. La Paz i = +22m.28s. (?PR₁), T₀ = 7h.11m.26s.

Jan. 2d. Readings also at 1h. (La Paz), 2h. (La Paz and San Fernando), 4h. (Manila), 5h. (Zi-ka-wei), 9h. (Stonyhurst), 13h. (Manila and Taihoku), 16h. (Helwan).

Jan. 3d. 20h. 54m. 36s. Epicentre 22° 0S. 174° 0E. (as on 1918 June 5d.).

$$A = -.922, B = +.097, C = -.375; \quad D = +.104, E = +.994; \\ G = +.373, H = -.039, K = -.927.$$

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Wellington	19.9	178	e 4 36	- 4	—	—	—	6.4
Sydney	23.2	235	5 24	+ 5	9 42	+13	12.0	13.9
Riverview	23.2	235	e 5 44	+25	10 9	+40	e 11.9	13.7
Melbourne	29.5	231	11 0	?S	(11 0)	-26	15.3	17.4
Adelaide	33.5	239	—	—	—	—	18.1	21.7
Perth	52.2	246	18 24	?	—	—	—	—
Victoria	89.9	36	45 45	?L	—	—	(45.8)	49.5
Toronto	116.8	50	—	—	—	—	e 49.8	50.5
San Fernando	121.3	0	25 24	PR ₂ ?	—	—	—	—
Vienna	148.2	330	e 19 43	[-10]	—	—	—	—
De Bilt	148.7	347	—	—	—	—	e 86.4	89.5
Uccle	150.2	347	—	—	—	—	83.4	90.4

Additional readings: Riverview gives eP = +5m.46s., eS = +10m.14s., MN = +13.3m., MZ = +13.9m. Melbourne S = +14m.6s. De Bilt MN = +89.6m. Apia gives a reading at 21hrs. only.

Jan. 3d. Readings also at 0h. (La Paz), 2h. (La Paz (2)), 3h. (La Paz and San Fernando), 5h. (La Paz), 6h. (La Paz and Athens), 7h. (San Fernando), 9h. (La Paz), 12h. (Apia and near Tokyo), 13h. (La Paz and Tokyo), 17h., 20h., and 21h. (La Paz), 22h. (Lick, Helwan, Osaka, and Kodaikanal).

Jan. 4d. Readings at 6h. (San Fernando and La Paz), 7h. (Batavia, Melbourne, and Riverview), 8h. (Helwan), 11h. (Taihoku), 14h. (La Paz and De Bilt), 19h. (Rio Tinto), 21h. (Algiers), 22h. (Taihoku).

Jan. 5d. Readings at 1h. (Lick), 3h. (near Tacubaya and Oaxaca), 7h. and 12h. (La Paz), 16h. (Wellington and near Tacubaya), 17h. (La Paz), 18h. (Lick), 19h. (La Paz and Taihoku), 22h. (Taihoku and Zi-ka-wei), 23h. (De Bilt, Helwan, Strasbourg, La Paz, Uccle, and Tortosa).

1921. Jan. 6d. 11h. 59m. 56s. Epicentre $7^{\circ}0S. 148^{\circ}0E.$

(as on 1920 Aug. 25d.).

A = -0.842, B = +0.526, C = -0.122; D = +0.530, E = +0.848;
G = +0.103, H = -0.065, K = -0.992.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	27.0	174	e 6 24	+26	e 11 7	+26	e 13.1	16.5
Sydney	27.0	174	8 52	+174	13 28	+167	16.0	16.9
Adelaide	29.3	196	11 28	?S	(11 28)	+ 6	18.1	21.3
Melbourne	30.9	185	13 4	?SR ₁	17 28	?L	18.9	23.6
Manila	34.4	309	e 7 4	- 4	—	—	—	—
Perth	39.0	226	—	—	13 55	+ 3	25.4	—
Batavia	40.9	269	e 8 15	+13	—	—	27.8	—
Wellington	41.8	149	e 10 16	PR ₁ ?	e 14 22	-10	e 23.1	27.1
Zi-ka-wei	45.9	328	e 8 33	+ 6	e 15 15	-12	—	—
Mizusawa	E. 46.6	353	8 38	- 6	15 25	-11	—	—
N. 46.6	353	8 19	-25	15 17	-19	—	—	—
Mauritius	87.7	250	—	—	—	—	—	48.2
Victoria	94.4	42	—	—	—	—	—	48.8
Helwan	116.5	299	31 4	?	57 4	?	—	—
Chicago	119.9	45	30 14	?	40 14	?	58.6	—
Vienna	122.0	324	—	—	—	e 63.6	71.1	—
Hamburg	122.5	332	—	—	—	e 61.1	—	—
Toronto	124.8	40	—	—	—	66.6	77.3	—
De Bilt	E. 125.6	331	e 31 10	?	e 49 58	?	e 63.1	73.4
N. 125.6	331	e 32 58	?	—	—	e 64.0	74.2	—
Eskdalemuir	126.5	340	—	—	—	68.6	—	—
Strasbourg	126.6	328	—	—	e 65 16	?L	e 70.1	—
Uccle	126.8	330	—	—	e 31 4	+85	61.1	75.1
Rocca di Papa	127.4	319	19 4	?	28 4	-99	—	—
Kew	128.4	335	—	—	—	—	84.0	—
Besançon	128.5	327	62 10	?L	—	—	(62.2)	74.1
Moncalieri	128.8	325	e 2 2	?	—	—	67.7	77.2?
Paris	129.0	330	—	—	—	e 74.1	75.1	—
Tortosa	135.5	323	—	—	—	e 73.0	81.3	—
La Paz	137.2	124	19 44	[+10]	i 23 34	?	67.1	94.4

Additional readings: Riverview gives PS = +11m.23s. and +12m.39s., MNZ = +18.4m. Adelaide S = +14m.28s. Wellington e = +17m.52s. and +20m.52s. Toronto eL = +69.8m. and +76.0m. Rocca di Papa = +74.5m. Moncalieri increased by 1h. for L and M. Paris MN = +77.1m.

Jan. 6d. 23h. 9m. 45s. Epicentre $38^{\circ}0N. 107^{\circ}0E.$

A = -0.230, B = +0.753, C = +0.616; D = +0.956, E = +0.292;
G = -0.180, H = +0.588, K = -0.788.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Zi-ka-wei	13.7	116	e 3 28	+ 6	—	—	—	—
Taihoku	17.8	133	—	—	—	—	e 9.1	—
Calcutta	E. 22.3	231	4 57	-12	—	—	8.0	—
N. 22.3	231	5 9	0	—	—	—	8.2	—
Simla	25.4	263	—	—	e 8 27	-104	—	12.0
Manila	26.5	148	—	—	9 15	-77	—	—
Kodaikanal	38.4	231	20 15	?L	—	—	(20.2)	—
Batavia	44.2	180	—	—	—	—	e 20.9	24.0
Helwan	61.6	285	35 15	?L	—	—	(35.2)	—
Hamburg	64.0	320	—	—	—	—	e 33.2	—
De Bilt	E. 67.2	320	—	—	—	—	e 36.2	38.7
N. 67.2	320	—	—	—	—	—	e 33.2	37.4
Strasbourg	67.8	315	—	—	—	—	e 36.3	—
Uccle	68.3	319	—	—	—	—	e 35.2	—
Eskdalemuir	69.4	325	—	—	—	—	39.2	—
Besançon	69.5	315	—	—	—	—	37.2	—
Moncalieri	69.8	311	—	—	—	—	36.6	—
Stonyhurst	69.9	322	e 41 27	?L	—	—	(41.4)	—
Kew	70.3	321	—	—	—	—	—	43.2
Tortosa	76.5	312	—	—	—	—	e 39.2	41.9

Additional readings: Helwan gives also PN = +34m.15s. Moncalieri e = 23h.1m.25s.

Jan. 6d. Readings also at 2h. (Kodaikanal), 3h. (Seychelles), 4h. (Manila and Kodaikanal (2)), 10h. (near Tacubaya), 13h. (La Paz), 16h. (Apia), 19h. (Rio Tinto), 20h. (Taihoku), 21h. (Apia).

1921. Jan. 7d. 1h. 0m. 36s. Epicentre 30°2S. 177°7W.

(as on 1918 Aug. 5d.).

A = -·864, B = -·035, C = -·503; D = -·040, E = +·999;

G = +·503, H = +·020, K = -·864.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Wellington	12·7	206	e 4 0	+51	i 6 0	+23	e 7·0	7·9
Riverview	26·6	254	e 5 42	-12	e 10 35	+2	e 12·5	14·9
Sydney	26·6	251	5 48	-6	10 24	-9	13·2	15·0
Melbourne	31·7	246	—	—	8 24	-219	16·7	18·9
Adelaide	36·9	256	12 48	?S	(12 48)	-34	18·6	22·9
Perth	56·0	250	—	—	16 44	-50	—	—
Manila	74·1	298	e 11 40	-3	—	—	12·6	—
Batavia	74·3	272	i 11 40	-4	i 21 7	-11	34·7	42·4
Berkeley	85·4	41	—	—	—	—	e 45·4	—
Victoria	92·4	33	—	—	(24 3)	-36	24·0	46·7
La Paz	97·7	114	13 50	-8	24 47	-46	46·4	49·8
Kodaikanal	107·9	272	55 0	?L	—	—	64·3	68·4
Chicago	109·6	53	—	—	—	—	68·4	—
Toronto	115·9	53	—	—	—	—	58·8	68·7
Eskdalemuir	154·6	7	—	—	—	—	53·4	—
Helwan	154·9	275	40 24	?SR ₁	—	—	—	—
Stonyhurst	156·0	7	e 80 54	?L	—	—	(e 80·9)	93·4
Hamburg	156·2	349	e 19 56	[- 7]	—	—	e 76·4	—
De Bilt	158·0	353	—	—	—	—	76·4	96·2
Kew	158·6	5	—	—	—	—	—	118·4
Vienna	159·1	333	i 20 0	[- 7]	—	—	—	—
Uccle	159·3	355	e 21 1	[+54]	—	—	e 78·4	—
Strasbourg	161·2	349	20 2	[- 7]	e 24 45	?PR ₁	e 27·4	—
Moncalieri	164·6	345	e 9 27	—	—	—	37·7	—
Rocca di Papa	165·7	327	i 20 10	[- 2]	—	—	—	—
Tortosa	169·3	5	20 13	[- 1]	—	—	e 80·4	92·6
Rio Tinto	169·4	42	96 24	?L	—	—	(96·4)	112·4
Granada	171·5	33	20 17	[+ 2]	30 4	?	—	—
Algiers	173·4	358	20 13	[- 3]	e 26 40	?	—	—

Additional readings: Riverview MN = +13·6m., MZ = +14·8m. Melbourne SR₁ = +12m.18s. Adelaide S = +15m.54s. Batavia iN = +12m.24s., i = +14m.38s., i = +21m.51s. Toronto eI = +65·7m. and +75·0m. La Paz i = +18m.0s., T₀ = 1h.0m.37s. Helwan PN = +46m.24s. De Bilt e = +50m.18s., MN = +82·4m. Granada i = +22m.21s. and +25m.33s. Apia gives a reading at 1h. only.

1921. Jan. 7d. 2h. 51m. 11s. Epicentre 53°0S. 140°0E.

A = -·461, B = +·387, C = -·799; D = +·643, E = +·766;

G = +·612, H = -·514, K = -·602.

(Epicentre 48°0S. 134°0E. of 1919 Mar. 4d. was tried. It satisfied Sydney, Riverview, Christchurch, and Manila fairly well, but was wide of the mark in all other cases, particularly in the case of Adelaide, Perth, and Batavia).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Melbourne	15·6	14	—	—	—	—	7·4	8·3
Adelaide	18·1	356	4 49	+31	6 43	-59	6·9	8·2
Sydney	20·7	27	4 43	-6	8 19	-19	10·1	11·1
Riverview	20·7	27	i 4 38	-11	e 8 23	-15	e 8·8	11·9
Christchurch	23·4	79	5 49	+28	10 13	+40	11·8	12·5
Wellington	26·0	77	e 5 49	+1	i 10 37	+15	e 12·8	16·3
Perth	27·3	311	6 21	+20	10 21	-25	11·8	—
Batavia	54·0	318	i 9 39	+6	—	—	—	20·9
Apia	54·6	63	—	—	—	—	8·8	—
Manila	69·6	340	e 10 49	-26	—	—	17·3	—
Cape Town	79·4	226	20 56	?S	(20 56)	-80	—	49·1
Kodaikanal	82·5	298	22 55	?S	(22 55)	+3	35·2	45·0

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Zi-ka-wei	85.8	344	e 19 50	?PR ₁	e 23 6	-22	—	—
Simla	100.3	309	—	—	—	—	e 47.4	50.0
La Paz	106.4	152	19 50	?PR ₁	31 2	?	53.8	73.6
Victoria	130.0	60	38 53	?	—	—	48.7	67.4
Athens	134.4	278	—	—	—	—	9.1	9.3
Rocca di Papa	143.5	274	e 19 49	[+ 3]	—	—	e 78.8	81.8
Padova	146.1	279	20 5	[+15]	—	—	—	—
Algiers	146.1	259	19 56	[+ 6]	—	—	77.8	86.3
Chicago	146.6	90	—	—	—	—	e 76.8	—
Moncalieri	148.3	275	e 10 17	?	—	—	20.9	—
Barcelona	149.7	266	—	—	—	—	e 82.6	—
Strasbourg	150.1	281	e 20 5	[+ 9]	—	—	—	—
Tortosa	150.2	263	20 14	[+18]	—	—	e 75.8	92.7
Hamburg	150.5	292	e 20 9	[+12]	—	—	e 82.8	—
San Fernando	151.2	252	—	—	—	—	82.7	87.3
Rio Tinto	152.4	250	78 49	4L	—	—	(78.8)	95.8
Toronto	152.6	94	—	—	—	—	80.3	85.9
De Bilt	153.0	287	—	—	—	—	e 76.8	92.0
Uccle	153.0	284	e 20 13	[+13]	—	—	e 74.8	—
Paris	153.3	279	—	—	—	—	e 83.8	91.8
Kew	155.9	283	—	—	—	—	—	98.8
Ottawa	155.7	94	—	—	—	—	e 78.3	—
Stonyhurst	157.9	288	e 50 1	?	—	—	—	99.3
Eskdalemuir	158.6	291	—	—	—	—	e 76.8	—
Edinburgh	158.6	293	—	—	—	—	—	95.8

Additional readings and notes : Riverview gives P = +4m.34s., MN = +12.4m.,
 MZ = +10.5m. Epicentre 13° 0'S. 151° 0'E., T₀ = 2h.50m.59s. Batavia
 i = +14m.46s. and +20m.10s. La Paz i = +25m.38s. Eskdalemuir
 L = +94.8m. Toronto L = +46.3m., eL = +89.6m., +109.9m., and
 +119.9m. Ottawa LE = +99.8m., +107.3m., and +114.8m. Paris
 MN = +93.8m. De Bilt eL = +43.4m., MN = +100.6m.

Jan. 7d. 9h. 42m. 25s. Epicentre 38° 0'N. 107° 0'E. (as on Jan. 6d.).

A = -230, B = +753, C = +616; D = +956, E = +292;
 G = -180, H = +588, K = -788.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Zi-ka-wei	E. 13.7	116	e 3 19	- 3	e 6 8	+ 7	—	9.1
Taihoku	17.8	133	—	—	—	—	e 8.6	—
Calcutta	E. 22.3	231	4 29	-40	8 29	-42	12.6	—
	N. 22.3	231	4 29	-40	8 35	-36	13.4	—
Osaka	23.1	90	5 22	+ 4	—	—	—	17.5
Tokyo	26.2	85	10 29	18	(10 29)	+ 3	e 16.3	20.0
Manila	26.5	148	e 6 1	+ 8	10 23	- 9	14.8	17.6
Batavia	44.2	186	—	—	—	—	e 23.3	27.3
Konigsberg	E. 57.8	317	—	—	25 42	?	33.4	—
	N. 57.8	317	—	—	e 23 22	?SR ₁	e 30.8	37.6
Helwan	E. 61.6	285	37 35	?L	—	—	(37.6)	—
Vienna	63.0	312	10 28	- 4	—	—	e 28.1	44.1
Hamburg	E. 64.0	320	—	—	—	—	e 31.6	35.4
De Bilt	67.2	320	—	—	—	—	e 36.7	42.6
Strasbourg	67.8	315	e 36 20	?L	39 28	?	41.4	—
Uccle	68.3	319	—	—	—	—	e 36.6	—
Rocca di Papa	68.5	307	e 10 43	-25	—	—	e 39.6	—
Edinburgh	69.0	325	—	—	—	—	—	44.6
Eskdalemuir	69.4	325	—	—	39 22	?	43.6	—
Moncalieri	69.8	311	9 36	-100	32 27	?L	38.7	—
Stonyhurst	69.9	322	e 39 47	?L	—	—	(e 39.8)	46.1
Kew	70.3	321	—	—	—	—	—	41.6

Additional readings: Tokyo gives also eS = +13m.58s. Manila MN =
 +16.7m. Helwan PN = +30m.3s. Hamburg MN = +38.7m. De
 Bilt eN = +40m.20s., eE = +41m.18s., MN = +43.9m.

Jan. 7d. Readings also at 7h. and 8h. (Colombo), 10h. (Taihoku), 11h. (near
 Tacubaya), 17h. (Apia, Wellington, Riverview, and near Batavia),
 18h. (San Fernando and near Osaka), 19h. (Helwan, near Tokyo, and
 near Mizusawa), 21h. (Lick), 23h. (La Paz).

Jan. 8d. 6h. 35m. 27s. Epicentre $14^{\circ}5N. 94^{\circ}0W.$

$A = -.068, B = -.966, C = +.250; D = -.998, E = +.070;$
 $G = -.017, H = -.249, K = -.968.$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tacubaya	7.0	315	2 26	—	—	—	3.9	4.6
Chicago	27.9	10	6 9	+ 2	10 51	- 6	13.3	—
Georgetown	28.6	28	e 5 19	-55	11 17	+ 7	e 15.0	—
Washington	28.6	28	6 15	+ 1	11 27	+17	—	—
Ann Arbor	E. 29.2	16	7 21	+61	11 39	+19	16.3	17.6
	N. 29.2	16	7 9	+49	—	—	16.1	—
Ithaca	31.8	26	e 7 11	+26	12 26	+21	19.3	—
Harvard	N. 34.2	30	—	—	—	—	14.3	—
Ottawa	34.5	23	7 8	- 1	12 50	+ 2	e 16.0	—
La Paz	40.2	140	e 7 59	+ 2	14 8	- 2	19.8	21.0
Uccle	84.0	39	—	—	—	—	e 39.5	—
De Bilt	E. 84.1	38	—	—	e 24 33	+84	e 39.6	42.4
Taihoku	127.4	318	—	—	—	—	e 75.6	—

Additional readings: Georgetown gives eSN = +10m.50s. Ithaca eN = +8m.19s., e = +14m.33s. Harvard LE = -20s. Ottawa PR₁ = +8m.15s., PR₂ = +8m.25s., L = +17.6m., T₀ = 6h.35m.23s.

Jan. 8d. Readings also at 2h. (Barcelona and Rocca di Papa), 12h. and 13h. (La Paz), 15h. (La Paz, Helwan, and San Fernando), 16h. (De Bilt), 17h. (Lick), 21h. (Tokio and San Fernando).

1921. Jan. 9d. 12h. 55m. 0s. Epicentre $14^{\circ}0S. 74^{\circ}5W.$

(as on 1916 Oct. 3d.).

$A = +.259, B = -.935, C = -.242; D = -.964, E = -.267;$
 $G = -.065, H = +.233, K = -.970.$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
La Paz	6.6	112	i 1 45	+ 4	3 0	0	3.8	4.0
Balboa Hts.	E. 23.5	347	5 12	-11	9 24	-11	12.2	9.5
	N. 23.5	347	5 8	-15	9 16	-19	12.0	9.7
	N. 23.5	347	5 13	-10	9 25	-10	11.9	9.9
Washington	53.0	357	9 16	-10	—	—	—	—
Georgetown	E. 53.0	357	9 21	- 5	16 42	-14	e 23.4	—
	N. 53.0	357	9 17	- 9	16 41	-15	—	—
Ithaca	56.5	358	—	—	17 23	-17	34.5	—
Harvard	56.5	3	—	—	—	—	33.0	—
Chicago	57.0	348	9 40	-12	17 28	-18	27.3	—
Ann Arbor	E. 57.0	352	—	—	17 12	-34	27.8	—
Toronto	57.8	356	—	—	i 18 12	+16	30.3	35.0
Ottawa	59.4	359	10 2	- 6	18 4	-12	28.7	—
Victoria	75.9	329	—	—	—	—	21.6	43.3
Coimbra	E. 81.7	44	—	—	27 46	+ ?SR ₁	39.0	45.9
	N. 81.7	44	14 26	+117	25 30	?	36.5	—
San Fernando	81.7	49	21 30	?	—	—	45.0	54.0
Rio Tinto	81.9	48	28 0	?SR ₁	—	—	—	61.0
Cape Town	84.6	124	23 12	?S	(23 12)	- 3	(42.0)	45.2
Tortosa	88.2	47	—	—	23 17	-37	36.0	51.4
Algiers	88.8	52	—	—	e 16 0	PR ₁ ?	47.5	57.0
Honolulu	89.2	292	—	—	e 25 42	+97	41.6	48.7
Barcelona	89.5	47	—	—	—	—	e 40.3	52.0
Oxford	90.8	37	—	—	i 23 40	-42	38.5	50.3
Stonyhurst	91.1	34	e 44 30	?L	—	—	(44.5)	52.5
Eskdalemuir	91.2	33	—	—	22 11	?	38.3	—
Kew	91.4	37	—	—	23 0	?	—	54.0
Edinburgh	91.5	32	—	—	—	—	47.0	51.5
Paris	92.2	40	—	—	e 23 45	-52	44.0	49.0

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Uccle	94.0	40	e 13 17	-21	e 23 50	-66	e 40.0	47.0
De Bilt	94.8	37	—	—	24 4	-60	45.0	50.2
Strasbourg	95.4	41	e 13 17	-28	—	—	48.0	—
Wellington	95.6	226	—	—	e 24 30	-42	e 49.4	73.0
Rocca di Papa	97.2	49	e 13 25	-30	—	—	56.1	64.1
Hamburg	98.1	37	13 0	-61	—	—	49.0	—
Vienna	101.0	42	e 17 48	PR ₁ ?	—	—	52.5	59.5
Konigsberg	104.3	37	—	—	—	—	53.6	—
Helwan	110.5	63	25 30	?S	(25 30)	-123	—	—
Riverview	115.2	221	—	—	—	—	e 57.3	61.7
Melbourne	116.3	214	—	—	—	—	e 62.0	65.0

Additional readings: La Paz $i = +2m.15s.$, $T_0 = 12h.55m.13s.$ Epicentre
 $13^{\circ}.0S.$ $72^{\circ}.5W.$ Ann Arbor $SN = +17m.6s.$ Toronto $e = +25m.0s.$
 $cL = +32.5m.$ and $+44.4m.$ Oxford $eS = +23m.3s.$ Chicago $L =$
 $+27.8m.$ Ottawa $PR_1E? = +12m.34s.$, $PR_2N? = +13m.25s.$, $SR_2E?$
 $= +24m.14s.$, $LE = +36.0m.$ and $+40.0m.$ De Bilt $eN = +24m.37s.$,
 $LN = +43.0m.$, $MN = +49.4m.$ Wellington $e = +33m.34s.$, $+41m.42s.$,
 $+58m.30s.$, and $+71m.18s.$ Helwan $PN = +29m.6s.$ Riverview
 $MN = +60.4m.$

Jan. 9d. 13h. 54m. 50s. Epicentre $22^{\circ}.5S.$ $173^{\circ}.5W.$ (as on 1913 June 26d.).

$$A = -.918, B = -.104, C = -.383; \quad D = -.113, E = +.994;$$

$$G = +.381, H = +.043, K = -.924.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia	8.9	11	2 10	-5	3 22	-39	5.0	5.3
Riverview	33.0	242	e 6 50	-6	e 12 10	-14	e 16.0	18.5
Sydney	33.0	242	12 58	?S	(12 58)	+34	17.7	18.8
Melbourne	38.6	237	—	—	—	—	19.7	23.2
Adelaide	43.4	242	—	—	—	—	—	26.8
Perth	62.5	244	2 33	?	—	—	—	—
Batavia	78.3	273	12 15	+6	22 2	-2	—	—
Taihoku	79.0	303	—	—	35 10	?	—	—
La Paz	97.2	111	22 18	?	—	—	48.2	51.8
Chicago	101.9	49	36 15?	?	44 10	?	e 51.5	—
Toronto	108.1	49	—	—	—	—	e 60.3	63.5
Ottawa	111.1	48	—	—	—	—	60.8	—
Kodaikanal	111.5	270	17 4	PR ₁	—	—	23.9	31.1
Cape Town	122.4	192	75 21	?L	—	—	(75.4)	—
Hamburg	149.1	356	e 19 55	[+ 1]	—	—	—	—
De Bilt	150.4	1	—	—	—	—	e 86.2	90.7
Uccle	151.7	3	e 20 7	[+ 9]	—	—	—	88.2
Vienna	153.1	345	e 19 10	[-50]	—	—	—	—
Paris	153.5	6	—	—	—	—	e 88.2	94.2
Strasbourg	153.9	358	e 20 1	[0]	—	—	—	—
Moncalieri	157.5	2	e 7 28	?	23 59	PR ₁	38.4	56.6
Marseilles	159.2	3	—	—	—	—	48.2	—
Rocca di Papa	160.1	347	i 20 13	[+ 5]	—	—	—	21.2
Tortosa	161.0	14	—	—	—	—	e 89.2	114.5

Additional readings: Riverview gives $PR_1 = +8m.2s.$, $MN = +17.5m.$
Ottawa $LE = +68.7m.$ and $+72.2m.$ Chicago $L = +55.0m.$ De Bilt
 $MN = +90.2m.$

Jan. 9d. 18h. 55m. 50s. Epicentre $40^{\circ}.0N.$ $136^{\circ}.5E.$

$$A = -.556, B = +.527, C = +.643; \quad D = +.688, E = +.725;$$

$$G = -.466, H = +.442, K = -.766.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	3.6	103	0 57	+ 1	1 43	+ 4	—
	N.	3.6	103	1 0	+ 4	1 47	+ 8	—
Tokyo		5.0	149	1 15	- 2	—	—	1.7
Osaka		5.4	190	1 22	- 1	—	—	2.7
Kobe	E.	5.4	192	1 23	0	2 18	-10	3.1
Zi-ka-wei		15.1	239	e 4 0	+20	—	e 9.3	—
De Bilt		78.7	332	—	—	—	e 47.2	—
La Paz		148.2	50	18 52	[-61]	—	—	—

Additional readings: Osaka $MN = +3.0m.$ Kobe North readings for P, S,
and L when diminished by 95s become the same as for east. Also $MN =$
 $+3.0m.$

Jan. 9d. Readings also at 3h., 4h., 15h. (2), 16h., 17h. (2), and 18h. (La Paz), 19h. (La Paz and Colombo), 20h., 21h., and 22h. (La Paz), 23h. (La Paz (2) and Oaxaca).

Jan. 10d. Readings at 0h. (Paris), 1h. (La Paz), 3h. (La Paz), 4h. (La Paz and Perth), 7h. (2), 8h., 9h., 11h., and 15h. (La Paz), 20h. (La Paz and San Fernando).

Jan. 11d. Readings at 9h. (La Paz), 10h. (Melbourne), 17h. and 18h. (La Paz), 20h. (Batavia), 22h. (La Paz).

Jan. 12d. 14h. 53m. 10s. Epicentre $33^{\circ}5'N$. $131^{\circ}9'E$. (Suggested by the Meteorological Observatory, Japan).

$$A = -\cdot557, B = +\cdot621, C = +\cdot552.$$

		Δ	P.	O-C.	S.	O-C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Matsuyama		0.8	10 26	+14	—	—	10.6	0.8
Kobe	E.	2.9	0 50	+5	—	—	—	—
Osaka		3.2	0 41	-9	(1 29)	+1	1.5	2.3
Gifu		4.5	1 12	+2	(2 2)	-2	2.0	—

No additional readings.

Jan. 12d. Readings also at 0h. (La Paz), 1h. (Helwan), 2h. (Batavia), 9h. and 15h. (La Paz), 18h. (San Fernando), 21h. (Taihoku), 22h. (near Tacubaya), 23h. (La Paz).

Jan. 13d. Readings at 0h. (near Taihoku), 5h. (La Paz), 10h. (Melbourne), 11h. (San Fernando), 17h. (Vienna and near Padova (2) and Florence (2)), 19h. (La Paz, Apia, and Rio Tinto), 20h. (near Florence and Padova), 21h. (Zi-ka-wei, La Paz, and Taihoku), 22h. (De Bilt, Manila, and Helwan), 23h. (Florence).

Jan. 14d. Readings at 0h. (Colombo and near Padova and Florence), 2h. (La Paz), 3h. (Florence), 4h. (Taihoku (2) and La Paz), 6h. (San Fernando and La Paz), 7h. (La Paz, Manila, De Bilt, and near Zi-ka-wei, Taihoku, Osaka, and Tokyo), 9h. (Riverview and Florence), 18h. (Apia), 19h. (Honolulu), 20h. (La Paz and San Fernando).

Jan. 15d. Readings at 1h. (San Fernando), 7h. (near Tacubaya), 10h. (Vienna), 12h. (Melbourne, Riverview, and near Athens), 13h. (Toronto, Victoria, and Helwan), 15h. (Georgetown), 20h. (San Fernando), 23h. (Azores).

Jan. 16d. 23h. 55m. 48s. Epicentre $38^{\circ}8'N$. $32^{\circ}9'E$. (as on 1920 Feb. 26d.).

$$A = +\cdot654, B = +\cdot423, C = +\cdot627; \quad D = +\cdot543, E = -\cdot840; \\ G = +\cdot526, H = +\cdot340, K = -\cdot779.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	7.2	266	1 51	+2	e 2 55	-20	3.1	3.9
Helwan	9.1	189	5 12	?L	—	—	(5.2)	—
Belgrade	11.0	307	2 43	-1	—	—	—	—
Pompeii	14.2	283	5 59	?S	(5 59)	-14	—	—
Vienna	15.2	314	i 3 47	+5	—	—	e 8.0	10.5
Rocca di Papa	15.6	287	i 3 50	+3	—	—	e 9.8	—
Padova	16.9	300	4 12	+8	9 13	?L	(9.2)	10.3
Moncalieri	19.6	296	4 38	+2	8 47	+32	11.4	13.8
Strasbourg	20.5	306	e 4 45	-2	—	—	—	—
De Bilt	23.3	314	—	—	—	—	e 13.2	—
Uccle	23.3	310	e 5 19	-1	e 9 24	-7	—	—
San Fernando	30.8	278	10 12	?S	(10 12)	-96	—	—

Athens gives $MN = +3.7m$,

Jan. 16d. Readings also at 0h. (Hamburg and San Fernando), 2h. (Taihoku), 4h. (La Paz (2)), 9h. (Victoria and Riverview), 10h. (Batavia), 13h. (Manila, Batavia, Helwan, and Taihoku), 16h. (La Paz), 21h. (Helwan).

Jan. 17d. Readings at 4h. (Wellington), 5h. (Apia), 6h. (Lick), 7h. (San Fernando), 13h. (La Paz), 14h. (Rio Tinto and La Paz), 17h. (La Paz), 20h. (San Fernando and Budapest), 22h. (Wellington).

Jan. 18d. Readings at 2h. and 3h. (La Paz), 4h. (Helwan), 6h. (San Fernando), 12h. (near Athens), 14h. (San Fernando), 19h. (Helwan).

Jan. 19d. 14h. 57m. 18s. Epicentre $45^{\circ}0'N$. $152^{\circ}1'E$. (as on 1918 Sept. 14d.).

$$A = -.625, B = +.331, C = +.707; \quad D = +.468, E = +.884; \\ G = -.625, H = +.331, K = -.707.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ootomari	6.7	294	1 49	+ 7	—	—	3.6	4.3
Mizusawa	10.0	238	2 37	+ 7	4 30	+ 1	—	—
Osaka	16.4	237	4 34	+37	—	—	—	11.1
Zi-ka-wei	27.6	251	e 6 2	- 2	e 10 42	-10	—	—
Manila	40.2	231	e 7 54	- 3	—	—	—	—
Victoria	55.1	54	—	—	16 10?	-72	24.5?	40.9
Konigsberg	72.1	333	—	—	—	—	40.4	46.2
Budapest	78.8	330	—	—	—	e 40.7	—	51.7
De Bilt	78.8	340	—	—	—	e 42.7	—	50.8
Stonyhurst	78.8	345	e 18 42	?	—	—	—	53.7
Riverview	78.9	181	e 22 17	?S	(e 22 17)	- 6	e 41.1	46.3
Uccle	80.2	340	—	—	—	—	e 35.7	—
Toronto	80.2	35	—	—	—	—	1 33.3	34.8
Ottawa	80.2	32	—	—	e 21 53	-32	47.2	—
Oxford	80.6	344	—	—	—	—	—	53.3
Strasbourg	81.4	337	e 12 5	-22	—	—	e 46.5	—
Paris	82.5	340	—	—	—	—	e 44.7	49.7
Harvard	84.5	31	—	—	—	—	50.7	—
Florence	84.6	332	20 42?	?	—	—	—	62.7
Helwan	87.8	312	22 42	?S	(22 42)	-68	—	—
Wellington	88.6	164	—	—	—	—	e 44.5	—
Tortosa	90.5	339	—	—	—	—	e 47.7	—
Rio Tinto	95.0	343	44 42	?L	—	—	(44.7)	82.7
San Fernando	96.3	343	24 0	?S	(24 0)	-79	—	65.7
La Paz	135.9	63	19 18	[-14]	—	—	—	—
Cape Town	143.1	271	22 54	?PR ₁	—	—	—	—

Additional readings: Mizusawa gives also $PN = +2m.44s.$ Konigsberg
 $LN = +40.9m.$ De Bilt $eLN = +41.7m.$ $MN = +53.6m.$ River-
view $eS? = +29m.57s.$ Toronto $eL = +43.6m.,$ $eL = +54.2m.$ Hel-
wan $PN = +20m.42s.$ La Paz $i = +23m.12s. (?PR_1).$ Eskdalemuir
gives 15h. only.

Jan. 19d. Readings also at 0h. and 1h. (Wellington), 2h. (Apia), 4h. (Manila), 7h. (San Fernando), 14h. (Granada and Moncalieri), 15h. (Kodaikanal), 18h. (Stonyhurst, De Bilt, Mizusawa, Ootomari, and Wellington), 20h. (Colombo).

Jan. 20d. 2h. 2m. 24s. Epicentre $7^{\circ}0'N$. $82^{\circ}5'W$. (as on 1919 Sept. 27d.).

$$A = +.130, B = -.984, C = +.122; \quad D = -.991, E = -.131; \\ G = +.016, H = -.121, K = -.992.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Balboa Hts.	3.5	55	1 22	+27	2 8	+31	2.6	2.8
Oaxaca	17.2	307	3 47	-20	7 19	- 3	8.2	9.2
Tacubaya	20.4	309	4 51	+ 5	9 3	+31	10.7?	12.2
La Paz	27.4	149	16 8	+ 6	i 11 0	+12	14.4	17.3
Georgetown	32.3	8	e 8 20	?PR ₁	—	—	17.9	—
Washington	32.3	8	5 45	-66	e 10 59	-74	18.3	—
Chicago	35.1	353	8 37	-83	15 30	?SR ₁	23.3	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Ann Arbor	E.	35.3	359	7 12	- 4	12 36	-24	16.9	—
Ithaca		35.8	359	—	—	—	e 19.6	—	—
Toronto		36.7	4	3 48	?	10 36	?PR ₁ e 17.3	21.7	—
Ottawa		38.8	7	9 28	?PR ₁	13 41	- 8 e 16.2	—	—
Victoria		53.2	330	—	—	—	—	29.9	35.3
Honolulu		74.1	291	—	—	e 22 12	+57 e 35.3	41.3	—
San Fernando		74.8	54	24 36	?SR ₁	—	—	—	—
Stonyhurst		78.5	38 e	27 36	?SR ₁	—	—	—	—
Uccle		82.6	40 e	23 0	?S (e 23 0)	—	+ 7 e 38.6	40.6	—
De Bilt		83.0	40	—	—	—	e 39.6	43.1	—
Helwan		106.8	56	66 36	?L	—	— (66.6)	—	—

Additional readings: Balboa Heights PN = +1m.20s., MN = +3.4m.
 Georgetown ePN = +8m.18s., LN = +19.3m. Ann Arbor PN = +7m.0s.
 Toronto e = +15m.42s., eL = +19.8m. Ottawa LE = +20.2m. Helwan PN = +65m.36s.

Jan. 20d. Readings also at 1h. (Honolulu, Riverview, Apia, and Wellington), 2h. (San Fernando), 3h. (Helwan), 9h. (Taihoku), 12h. (Helwan), 18h. (Apia), 20h. (near Tacubaya), 22h. (Helwan), 23h. (La Paz).

Jan. 21d. Readings at 2h. and 3h. (Helwan), 6h. (La Paz), 15h. (Taihoku and near Athens), 17h. (La Paz), 21h. (San Fernando and Batavia).

Jan. 22d. Readings at 0h. (Taihoku), 1h. (Algiers), 7h. (Apia and Taihoku), 9h. (La Paz), 10h. (Algiers and La Paz), 11h. (Algiers), 12h. (Barcelona and near Tortosa and Granada), 13h. (Azores and La Paz), 18h. (Helwan), 22h. (San Fernando), 23h. (La Paz).

Jan. 23d. 16h. 18m. 57s. Epicentre 2°·0N. 20°·5W.

A = +.936, B = -.350, C = +.035; D = -.350, E = -.937;
 G = +.033, H = -.012, K = -.999.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
San Fernando	E.	36.9	20	12 3	?S	(12 3)	-79	—	14.0
	N.	36.9	20	13 3	?S	(13 3)	-19	—	15.0
La Paz		50.5	246	9 9	- 1	—	—	25.2	26.5
Uccle		53.1	20	—	—	e 16 57	0 e 27.0	—	—
De Bilt		54.5	20	—	—	—	e 28.0	31.0	—
Helwan		56.4	55	17 3	?S	(17 3)	-36	—	—

No additional readings.

Jan. 23d. Readings also at 2h. (La Paz), 3h. (Helwan, La Paz, and Apia), 5h. (Algiers), 9h. (Rocca di Papa and near Athens), 12h., 15h., and 16h. (Wellington), 20h. (La Paz), 21h. (Wellington), 22h. (San Fernando), 23h. (Wellington).

Jan. 24d. 11h. 16m. 36s. Epicentre 12°·2S. 118°·0E.

A = -.459, B = +.863, C = -.211; D = +.883, B = +.470;
 G = +.099, H = -.187, K = -.977.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia		12.5	297	3 6	0	i 5 32	—	i 6.4	7.3
Manila		26.9	6	e 5 57	0	—	—	—	—
Kodaikanal		46.1	297	9 48	+67	—	—	14.4	16.0
Wellington		57.2	133	—	—	—	—	e 45.0	—
Helwan		93.2	300	31 24	?	—	—	—	—
La Paz		150.7	168	20 29	[+32]	—	—	—	—

Additional readings: Batavia gives also i = +7m.0s. Helwan PN = +34m.24s.

Jan. 24d. Readings also at 0h. (Wellington), 1h. (Helwan), 3h. (Wellington and La Paz), 10h. (Zi-ka-wei), 16h. (Colombo), 19h. (La Paz), 22h. (San Fernando), 23h. (Mizusawa).

Jan. 25d. 10h 27m. 55s. Epicentre $41^{\circ}9'N$. $142^{\circ}1'E$. (suggested by Meteorological Observatory, Japan).

$$A = -.587, B = +.457, C = +.688.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Hakodate	1.0	e 0 15	— 0	—	—	0.5	0.7
Sapporo	1.3	0 23	+ 3	(0 40)	+ 4	0.7	—
Mizusawa	2.9	0 37	— 8	1 18	— 2	—	—
Mito	5.7	1 12	— 16	(2 21)	— 15	2.4	—
Tokyo	6.5	1 22	— 17	—	—	c 1.9	1.9

Additional readings : Hakodate gives also MN = +0.6m. Mizusawa PN = +0m.38s.

Jan. 25d. Readings also at 1h. (Taihoku), 3h. (near Tokyo), 8h. (San Fernando), 13h. (near Kobe), 16h. and 18h. (near Tacubaya), 19h. and 21h. (La Paz), 22h. (Marseilles).

Jan. 26d. 17h. 55m. 8s. Epicentre $4^{\circ}0'N$. $97^{\circ}0'E$. (as on 1916 July 27d.).

$$A = -.112, B = +.990, C = +.070; \quad D = -.993, E = -.122; \\ G = -.009, H = +.070, K = -.998.$$

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.
Batavia	14.1	136	i 3 17	— 10	—	—	c 8.9
Manila	25.8	65	e 5 40	— 6	—	—	—
Zi-ka-wei	35.6	37	e 9 44	[PR]	c 13 8	+ 4	—
La Paz	160.8	224	20 15	[+ 6]	—	—	—

Batavia gives also iS = M = +4m.42s.

Jan. 26d. Readings also at 3h. (Helwan and near Athens), 4h. (San Fernando), 10h. (Fordham and near Manila), 13h. (2) and 14h. (La Paz), 23h. (San Fernando).

Jan. 27d. 11h. 30m. 9s. Epicentre $36^{\circ}0'N$. $28^{\circ}0'E$. (as on 1919 Aug. 24d.).

$$A = +.714, B = +.380, C = +.588; \quad D = +.470, E = -.883; \\ G = +.519, H = +.276, K = -.809.$$

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Athens	3.9	302	1 15	+14	1 54	+ 7	2.0	2.1
Helwan	6.7	154	3 51	?L	—	—	(3.8)	—
Belgrade	10.5	329	2 14	— 23	—	—	—	—
Pompeii	11.6	298	3 43	+50	4 13	— 56	—	—
Budapest	13.2	333	—	—	—	—	e 7.4	10.4
Rocca di Papa	13.2	301	7 3	?L	—	—	(7.0)	7.8
Padova	15.4	312	—	—	—	—	—	11.0
Konigsberg	19.5	347	—	—	—	—	11.8	12.8
Besançon	19.8	312	—	—	8 10	— 9	—	12.8
Algiers	20.0	280	c 4 41	0	—	—	—	—
Hamburg	21.6	330	—	—	—	—	e 10.8	13.8
Uccle	22.5	318	—	—	e 9 8	— 7	—	—
De Bilt	22.8	322	—	—	c 9 18	— 3	e 12.4	15.6

Additional readings and notes : Helwan gives also PN = +7m.51s. Budapest readings have been increased by 30m. De Bilt MN = +12.9m.

Jan. 27d. Readings also at 0h. (Batavia), 1h. (Apia), 5h. (La Paz), 9h. (near Tacubaya), 12h. (Fordham), 14h. (Granada, La Paz, San Fernando, Uccle, De Bilt, Algiers and Helwan), 17h. (near Mizusawa), 18h. (La Paz, near Athens, and near Mizusawa), 22h. (San Fernando, near Chur, and Zurich), 23h. (near Tacubaya).

Jan. 28d. Readings at 4h. (La Paz), 8h. (San Fernando), 10h. (Helwan), 15h. (Melbourne and Helwan), 23h. (La Paz and San Fernando).

Jan. 29d. Readings at 4h. (Wellington), 20h. (San Fernando and La Paz), 21h. (Helwan and De Bilt), 22h. (near Padova and Florence).

Jan. 30d. 18h. 58m. 38s. Epicentre $0^{\circ}5S$. $93^{\circ}0W$.

A = -0.52, B = -0.99, C = -0.09; D = -0.99, E = +0.52;

G = 0.00, H = +0.09, K = -1.000.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Oaxaca	E.	17.9	349	5 8	+52	8 42	+64	9.6	10.4
Tacubaya	E.	20.8	343	4 47	- 4	8 34	- 6	9.6	10.1
La Paz		29.2	124	c 6 20	0	11 20	0	14.4	16.1
Victoria		55.5	336	9 46?	+ 3	—	—	—	28.4
De Bilt	E.	95.4	38	—	—	—	—	e 45.4	—

De Bilt gives also $eLN = +48.4m$.

Jan. 30d. Readings also at 0h. and 4h. (Helwan), 5h. (Wellington (2)), 7h. (Manila and Batavia), 10h. (Manila, Batavia, and near Tokyo), 14h. (La Paz, Toronto, and Riverview), 18h. (Nagasaki), 20h. (La Paz and near Tacubaya).

Jan. 31d. Readings at 0h. (Malabar, Batavia, and Toronto), 9h. (Batavia), 20h. (Rocca di Papa), 21h. (La Paz), 23h. (Lick).

Feb. 1d. Readings at 0h. (Tokyo), 3h. (Hokoto, Taihoku, and Zi-ka-wei), 7h. (La Paz and near Pompeii and Rocca di Papa), 8h. (Helwan), 11h. (La Paz), 13h. (near Padova), 14h. (La Paz), 19h. (Taihoku).

Feb. 2d. Readings at 1h. (Lick (3) and Taihoku), 2h., 3h., and 4h. (La Paz), 8h. (Apia), 15h. (Algiers and near Tacubaya).

Feb. 3d. Readings at 0h. (Lick), 10h. (Rocca di Papa), 12h. (Lick and near Tacubaya), 13h. (Lick), 15h. (Algiers and near Tacubaya), 17h. (Rocca di Papa), 19h. (Batavia, Colombo, De Bilt, Helwan, Manila, Taihoku, and Uccle), 20h. (Zi-ka-wei).

1921. Feb. 4d. 8h. 22m. 35s. Epicentre 16° 5'N. 89° 5'W.

A = +.009, B = -.959, E = +.284; D = -1.000, E = -.009;

G = +.002, H = -.284, K = -.959.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Oaxaca		7.0	276	1 31	-15	—	—	2.1	2.2
Tacubaya	E.	9.7	289	1 46	-40	—	—	3.1	3.7
Balboa Heights	E.	12.2	127	3 7	-5	5 55	+31	9.9	4.3
	N.	12.2	127	3 8	+6	6 12	+48	9.8	10.1
	E.	12.2	127	3 5	+3	4 35	-49	8.6	9.3
	N.	12.2	127	3 6	+4	5 52	+28	9.3	9.6
Port au Prince		16.5	80	1 5 35	?	(7 1)	-6	7.0	10.4
Mazatlan	E.	17.3	296	1 12	—	3 52	?P	5.3	6.5
St. Louis	E.	22.2	358	1 5 31	+24	9 13	+4	9.6	—
	N.	22.2	358	1 5 7	0	9 7	-2	—	—
Porto Rico	E.	23.0	82	5 45	+28	9 55	+30	12.1	13.8
	N.	23.0	82	—	—	—	—	12.2	12.6
Cheltenham	E.	24.8	24	e 5 37	+1	i 10 45	+46	14.5	16.4
	N.	24.8	24	e 5 39	+3	e 10 46	+47	e 15.3	15.8
Georgetown	E.	24.8	23	5 46	+10	11 3	+64	—	15.8
	N.	24.8	23	5 42	+6	11 16	-77	—	17.9
Washington		24.8	23	4 45	-51	9 58	-1	13.2	15.8
Tucson	E.	24.9	313	5 8	-29	i 9 19	-42	10.9	12.6
	N.	24.9	313	5 9	-28	—	—	12.1	13.1
Chicago		25.3	3	2 30	?	9 59	-10	18.5	10.4
Ann Arbor	E.	26.3	10	6 13	+22	11 13	+45	13.8	18.2
	N.	26.3	10	6 7	+16	11 1	+33	13.8	22.4
Ithaca		28.3	20	e 6 15	+4	e 11 43	+39	14.9	—
Toronto		28.4	15	i 6 49	-37	i 12 13	+67	i 17.2	19.5
Harvard	E.	30.3	27	e 6 28	-3	12 4	+25	e 14.0	21.4
	N.	30.3	27	i 6 25	-6	11 37	-2	14.4	—
Ottawa		31.1	21	6 36	-3	11 48	-5	e 14.8	19.6
Northfield		31.1	25	6 37	-2	11 50	-3	15.2	22.4
Lick	E.	35.1	314	e 7 2	-12	e 11 54	-63	e 16.0	21.0
	N.	35.1	314	e 6 59	-15	e 11 53	-64	e 16.2	17.0
Halifax		35.6	32	7 44	+26	13 50	+46	e 13.4	24.4
Berkeley	E.	35.9	315	e 7 44	+23	e 13 5	-4	e 17.4	19.4
	N.	35.9	315	8 6	+45	e 13 5	-4	e 17.4	18.9
	V.	35.9	315	e 7 44	+23	e 13 7	-2	e 17.4	—
La Paz	N.	39.2	147	i 7 45	-3	i 13 19	-5	18.8	20.6
Victoria		42.2	328	7 47	-25	13 11	-87	21.6	25.5
	Z.	42.2	328	7 51	-21	13 35	-63	17.2	27.6
Azores		59.4	56	15 43	?	—	—	—	19.7
Coimbra	E.	72.7	52	10 51	-43	19 47	-71	34.9	37.5
	N.	72.7	52	—	—	i 20 22	-36	31.6	37.1
Eskdalemuir		74.3	37	11 47	+3	21 48	+30	—	48.1
Edinburgh		74.4	37	11 51	-6	21 29	+10	36.4	47.5
Rio Tinto		74.4	55	16 25	?	—	—	—	49.4
Dyce	E.	74.8	35	i 11 33	-15	21 18	-6	30.4	41.6
	N.	74.8	35	i 11 33	-15	21 33	-9	30.4	41.1
Stonyhurst		75.0	39	i 12 13	+24	21 49	-23	37.2	48.3
San Fernando		75.0	57	12 13	+24	22 1	+35	36.7	52.4
Oxford		76.0	40	i 12 5	+10	21 55	+18	37.6	44.4
Kew		76.7	40	18 25	?	—	—	—	50.4
Granada		76.9	55	i 12 1	+1	i 22 28	+40	—	—
Paris		79.0	43	e 12 25	+12	i 22 23	+11	34.4	43.4
Tortosa		79.3	50	12 31	+16	22 34	+19	34.7	—
Uccle		79.7	40	i 12 22	+5	i 22 31	+11	34.4	42.5
De Bilt		79.8	39	12 26	+8	22 36	+15	39.0	42.9
Barcelona		80.4	50	e 12 33	+12	—	—	e 35.3	43.4
Besançon		81.6	41	12 36	+8	22 26	-16	39.4	—
Marseilles	E.	82.2	47	e 12 55	+24	23 8	+20	e 38.4	44.8
Algiers		82.2	54	12 41	+10	22 53	+5	33.4	43.9
Hamburg		82.3	37	e 12 10	+8	i 22 55	+6	e 40.0	41.4
Strasbourg		82.4	42	12 35	+3	i 22 51	+1	e 37.0	46.5
Zurich		83.2	44	e 12 37	0	e 23 1	+2	—	—
Moncalieri		83.4	45	12 43	+5	22 46	-15	36.4	55.1
Padova		86.0	44	13 3	+10	23 24	-6	40.2	46.6
Florence		86.1	46	12 25	-29	22 25	-66	—	49.9
Königsberg	E.	87.5	33	13 6	+4	i 23 22	-25	43.2	—
	N.	87.5	33	13 4	+2	i 23 22	-25	e 37.5	—
	Z.	87.5	33	i 13 1	-1	23 27	-20	42.7	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Pola	87.5	44	e 12 46	-16	i 23 17	-30	e 37.9	54.7
Rocca di Papa	87.8	48	i 13 10	+ 6	i 23 28	-22	e 37.1	48.1
Vienna	87.9	40	i 13 4	0	i 24 28	+37	e 43.9	50.9
Pompeii	E. 89.4	48	13 27	+15	23 42	-25	—	47.4
Budapest	89.8	39	e 13 45	+30	e 18 25	?PR ₁	e 49.4	52.4
Lemberg	91.7	37	e 13 19	- 6	e 23 43	-49	e 46.6	58.6
Athens	E. 96.9	47	e 13 38	-16	i 24 21	-64	e 44.4	55.7
Wellington	105.0	230	e 14 1	-33	24 37	-125	e 47.2	—
Helwan	E. 106.6	51	19 1	?PR ₁	—	—	—	75.7
	N. 106.6	51	21 25	?	—	—	—	77.4
Cape Town	113.8	120	20 3	?PR ₁	36 2	?SR ₁	—	61.6
Sydney	123.2	240	19 55	?PR ₁	25 37	-216	30.4	31.0
Riverview	123.2	240	—	—	e 30 11	+58	e 54.8	56.2
Zi-ka-wei	123.8	328	e 20 53	?PR ₁	—	—	—	—
Melbourne	128.0	234	—	—	31 31	+104	58.2	69.9
Taihoku	128.6	322	e 36 25	?	—	—	e 77.4	—
Simla	130.7	15	21 25	?PR ₁	41 7	?SR ₁	65.1	68.1
Adelaide	133.5	236	—	—	21 13	?PR ₁	31.2	42.7
Manila	136.7	315	22 15	?PR ₁	37 10	?	73.8	74.6
Bombay	141.6	26	19 42	[0]	—	—	—	—
Kodaikanal	150.0	27	28 1	?	—	—	36.4	37.8
Perth	152.4	232	18 55	?	—	—	—	—
Colombo	154.3	25	36 25	?	—	—	43.4	44.4
Batavia	161.1	301	20 4	[- 5]	—	—	e 81.4	—

Additional readings and notes: Oaxaca reading has been increased by 5m. Port au Prince gives S = +5m.57s. Mazatlan readings are given as at 9h. Porto Rico PR₁ = +6m.25s., SR₁E = +11m.0s., SR₁N = +10m.50s. Cheltenham PR₁ = +5m.59s., SR₁E = +11m.54s. Washington MN = +14.8m. Tucson PR₁ = +5m.33s., SR₁N = +9m.47s. Toronto iS? = +13m.7s., iL = +18.7m., eL = +31.8m. Harvard iE = +6m.49s., iN = +6m.55s., +7m.47s., +12m.33s., and +13m.9s., T₀ = 8h.22m.13s. Ottawa LE = +40.4m. and +52.4m., T₀ = 8h.22m.37s. Halifax PR₁ = +8m.57s., L = +37.4m., T₀ = 8h.22m.36s. Berkeley PV = +8m.7s., PE = +8m.8s., T₀ = 8h.23m.34s. La Paz i = +14m.48s. and +17m.9s., LE = +19.1m., T₀ = 8h.22m.40s. Edinburgh PR₁ = +15m.43s. San Fernando MN = +43.5m. Granada gives its readings as on 5d. Uccle i = +23m.24s., MN = +50.0m. Epicentre 15°N. 90°W. De Bilt PR₁E = +15m.43s., MN = +43.9m. Hamburg MN = +53.7m. Strasbourg MN = +47.6m., MZ = +49.7m. Moncalieri MN = +47.2m. Königsberg PR₁ = +16m.38s., SR₁ = +30m.0s., eLE = +38.2m. Pola MN = +48.6m. Vienna iSN = +24m.34s., iE = +24m.56s. and +29m.7s., MZ = +49.9m. Athens ePN = +13m.14s. Riverview ePR₁ = +19m.59s., eSR₁ = +27m.19s., and +32m.25s. L Rep. = +113.9m. Melbourne ePR₁ = +20m.37s. Manila e = +19m.42s.?[P], O-C = +9s., PN = +22m.49s., MN = +75.6m. Batavia i = +11m.11s., +27m.21s., +34m.15s., and +37m.48s., eL = +43.4m. and +106.4m.

Feb. 4d. Readings also at 1h. (Zi-ka-wei), 3h. (Taihoku), 8h. (Riverview), 9h. (Kodaikanal and La Paz), 10h. (Taihoku), 13h. (Batavia), 16h. (Wellington), 18h. (Apia), 19h. (near Tacubaya (3), 21h. (La Paz and near Tacubaya).

Feb. 5d. Readings at 3h. (Balboa Heights, Apia, and near Tacubaya), 4h. (Oaxaca), 5h. (near Tokyo, near Oaxaca, and Tacubaya (2)), 7h. (La Paz), 8h. (Batavia and Manila), 9h. (La Paz and De Bilt), 12h. (La Paz and near Tacubaya), 13h. (2) and 15h. (near Tacubaya), 18h. (near Tokyo).

Feb. 6d. 4h. 27m. 24s. Epicentre $48^{\circ}6'N$. $159^{\circ}4'E$. (as on 1914 Feb. 7d.).

$$A = -\cdot619, B = +\cdot233, C = +\cdot750; \quad D = +\cdot352, E = +\cdot936; \\ G = -\cdot702, H = +\cdot264, K = -\cdot661.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	11.3	268	2 46	- 3	(4 53)	- 9	4.9	—
Hakodate	14.8	249	e 3 49	+13	—	—	—	—
Tokyo	19.4	235	e 4 57	+23	—	—	e 8.8	10.3
Zi-ka-wei	33.4	250	e 7 43	+43	e 13 5	+35	—	—
Taihoku	37.7	243	—	—	—	—	e 18.6	—
Manila	46.3	235	e 9 47	+65	—	—	—	—
Victoria	48.9	59	15 57	?S	(15 57)	- 8	—	33.2
Konigsberg	71.0	336	—	—	—	—	40.4	46.8
Chicago	72.1	46	21 6	?S	(21 6)	+15	37.6	—
Ann Arbor	73.5	42	—	—	—	—	54.7	—
Toronto	74.3	40	—	—	—	—	i 40.6	50.3
Ottawa	74.4	36	—	—	—	—	e 39.2	—
Edinburgh	74.5	350	—	—	—	—	—	69.6
Hamburg	74.6	341	e 11 48	+ 2	—	e 41.6	50.0	—
Eskdalemuir	75.1	350	21 27	?S	(21 27)	0	38.6	52.6
Stonyhurst	76.5	349	e 21 0	?S	(e 21 0)	-43	—	45.1
De Bilt	E. 76.9	344	—	—	—	e 40.6	50.5	—
N. 76.9	344	e 14 6	?PR ₁	—	—	e 42.6	52.0	—
Kodaikanal	77.0	271	22 6	?S	(22 6)	+17	—	—
Budapest	77.9	333	e 13 30	+84	—	e 42.6	51.6	—
Vienna	78.0	336	i 12 8	+ 1	e 22 48	+48	e 42.6	51.6
Oxford	78.3	348	—	—	—	—	46.9	54.6
Uccle	78.4	345	e 12 11	+ 2	e 21 54	-11	e 35.6	51.1
Kew	78.5	348	—	—	—	—	—	54.6
Harvard	78.8	35	—	—	42 36	? e 50.2	—	—
Georgetown	79.2	40	—	—	—	—	52.2	—
Strasbourg	79.8	340	e 12 27	+ 9	—	e 43.6	—	—
Paris	80.6	345	—	—	—	e 47.6	54.6	—
Moncalieri	83.2	340	e 12 54	+17	—	—	32.2	54.8
Florence	83.4	337	27 16	?SR ₁	—	—	—	54.6
Pompeii	E. 85.4	334	13 39	+49	—	—	54.6	—
Helwan	88.8	317	23 36	?S	(23 36)	-25	—	—
Coimbra	90.6	350	—	—	—	e 55.6	—	—
La Paz	129.9	65	19 40	[+22]	—	—	23.0	23.3

Additional readings: Konigsberg gives also $LN = +44.2m$. Chicago $S? = +29m.16s.$, $L = +92.1m$. Ann Arbor (Wiechert), $LE = +54.6m$. Toronto $eL = +48.2m$. Ottawa $L = +43.6m$. and $+52.1m$. Hamburg $MN = +48.7m$. Eskdalemuir $L = +43.6m$. Uccle $SR_1 = +27m.54s$. Harvard $e = +45m.28s$. and $+47m.29s$. Georgetown $LN = +51.9m$. Paris $MN = +52.6m$. Pompeii readings have been corrected by $-1h$.

Feb. 6d. Readings also at 1h. (La Paz), 7h. (Kodaikanal), 21h. (Harvard), 22h. (Taihoku).

Feb. 7d. Readings at 14h. (near Rocca di Papa), 17h. (Taihoku and La Paz), 18h. (Taihoku and Zi-ka-wei), 21h. (Apia).

Feb. 8d. Readings at 2h. (Taihoku and near Tokyo), 4h. (near Colima), 7h. (near Tacubaya), 9h. (Taihoku and Wellington), 10h. (Wellington), 12h. (Zi-ka-wei and Taihoku), 14h. (Strasbourg), 17h. (Taihoku), 18h. (near Tacubaya).

Feb. 9d. Readings at 13h. (Manila), 15h. (near Tokyo), 18h. (Apia and La Paz), 20h. (De Bilt and Helwan), 23h. (Taihoku).

Feb. 10d. 19h. 42m. 16s. Epicentre 3° 0'S. 177° 5'E.

A = -0.998, B = +0.044, C = -0.052; D = +0.044, E = +0.999;
 G = +0.052, H = -0.002, K = -0.999.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	15.2	136	3 50	+ 8	6 20	-17	—	—
Wellington	38.4	183	—	—	e 13 44	0	15.4	16.7
Riverview	39.4	217	e 7 44	- 6	e 13 48	- 9	16.2	19.4
Sydney	39.4	217	9 8	?PR ₁	13 56	- 1	16.9	20.1
Christchurch	40.8	185	11 44	?PR ₁	16 32	?SR ₁	19.2	22.5
Melbourne	45.8	218	—	—	e 15 44	+19	22.5	24.8
Adelaide	48.2	224	16 2	?S	(16 2)	+ 6	21.3	27.9
Manila	58.7	290	e 13 29	?PR ₁	—	—	—	—
Perth	64.5	236	—	—	—	—	28.2	—
Batavia	70.4	267	e 13 48	?PR ₁	—	—	—	—
Victoria	72.5	37	—	—	—	—	—	43.7
Chicago	95.6	48	—	—	—	—	e 54.7	—
Ottawa	103.8	44	—	—	—	—	e 56.7	—
La Paz	112.4	110	20 49	?PR ₁	—	—	51.7	60.1
Eskdalemuir	127.7	0	—	—	—	—	75.7	—
Stonyhurst	129.1	1	e 43 44	?SR ₁	—	—	(e 73.7)	86.7
De Bilt	E. 130.5	8	—	—	—	—	e 77.7	90.2
	N. 130.5	8	—	—	—	—	e 69.7	85.0
Oxford	131.2	2	—	—	—	—	—	89.4
Vienna	131.9	18	21 51	?PR ₁	—	—	—	—
Strasbourg	133.6	11	e 21 55	?PR ₁	—	—	—	—
Paris	133.9	4	e 22 0	?PR ₁	—	—	—	—
Helwan	138.2	47	45 44	?SR ₁	—	—	—	—
Coimbra	142.4	353	—	—	74 0	?L	82.7	—

Additional readings: Apia gives also +5m.32s. Epicentre 26° 0'S. 176° 0'W.,
 T₀ = 19h.43m.0s. Riverview PS = +14m.22s., MN = +17.3m., MZ =
 +20.6m. Christchurch SR₁ = +17m.26s. Adelaide S = +20m.2s.
 (1SR₁). Ottawa eLE = +61.7m. Stonyhurst gives eL as eP of a later
 shock.

Feb. 10d. 23h. 53m. 35s. Epicentre 17° 6'N. 148° 1'E.

A = -0.809, B = +0.504, C = +0.302; D = +0.528, E = +0.849;
 G = -0.257, H = +0.160, K = -0.953.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	19.5	339	4 35	0	e 5 25	?	7.5	9.6
Mito	20.0	342	4 39	- 2	(8 15)	- 8	8.2	—
Osaka	20.5	329	4 46	- 1	(8 7)	-27	8.1	9.2
Kobe	20.6	328	4 54	+ 6	(8 39)	+ 3	8.6	8.8
Mizusawa	E. 22.4	345	5 6	- 4	9 6	- 7	—	—
	N. 22.4	345	5 4	- 6	8 51	-22	—	—
Hakodate	25.0	347	6 2	+24	—	—	—	6.8
Taihoku	26.1	291	e 5 53	+ 4	(9 50)	-34	9.8	—
Manila	26.2	267	e 5 50	0	(11 4)	+38	11.1	11.8
Jinsen	N. 27.5	321	e 5 51	-12	10 12	-38	—	16.1
Zi-ka-wei	27.7	304	e 6 5	0	10 27	-27	—	—
Batavia	47.1	243	e 8 17	-31	—	—	—	—
Riverview	51.5	177	e 9 18	+ 1	e 16 41	+ 3	22.5	24.4
Adelaide	53.3	190	16 49	?S	(16 49)	-11	24.4	35.6
Perth	58.4	214	—	—	17 55	- 9	—	—
Victoria	76.0	44	22 5	?S	(22 5)	+28	35.8	41.3
Konigsberg	N. 95.1	334	—	—	—	—	52.5	—
Hamburg	100.3	336	e 18 0	?PR ₁	—	—	e 52.4	—
Budapest	100.5	328	—	—	—	—	e 52.4	55.4
Vienna	101.3	330	e 18 23	?PR ₁	—	—	e 52.4	62.4
Chicago	101.5	39	—	—	—	—	e 49.9	—
Edinburgh	102.6	343	—	—	—	—	51.4	62.2
Helwan	102.8	307	27 25	?S	(27 25)	+63	—	—
Eskdalemuir	103.2	343	24 39	?S	(24 39)	-107	43.9	62.4
De Bilt	103.3	337	—	—	e 27 25	+58	e 47.4	54.9
Ann Arbor	103.5	36	—	—	—	—	54.4	—
Stonyhurst	104.3	341	25 55	?S	(25 55)	-41	—	72.9
Toronto	104.7	33	—	—	e 25 37	-62	55.6	69.1
Ottawa	105.6	29	—	—	e 25 13	-95	55.9	—

Continued on next page.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Kew	105.7	340	—	—	—	—	—	65.4
Oxford	105.7	340	—	—	—	—	50.6	58.1
Paris	106.8	337	—	—	—	—	e 54.4	57.4
Uccle	104.6	337	—	—	—	—	e 53.4	—
Rocca di Papa	107.8	326	e 19 43	?PR ₁	32 49	?SR ₁	e 54.1	61.1
Washington	109.5	35	—	—	—	—	e 58.4	—
Harvard	110.0	29	—	—	39 4	?	53.6	—
Coimbra	118.2	339	—	—	—	—	e 59.7	—
Rio Tinto	119.8	336	63 25	?L	—	—	(63.4)	82.4
La Paz	145.4	92	20 0 (+11)	—	34 45	?	70.4	72.0

Additional readings and notes: Tokyo gives also MN = +12.0m. Osaka MN = +10.4m. Hakodate MN = +10.9m. Batavia i = +8m.57s. and +11m.10s. Riverview PS = +17m.26s., MN = +26.3m., MZ = +29.6m., T₀ = 23h.53m.43s. Adelaide PR₁ = +19m.31s., S = +22m.13s. Victoria S = +27m.59s. Königsberg LN = +58.2m. Chicago L = +53.9m. and +61.9m. Helwan PN = +34m.25s. Eskdalemuir S = +33m.3s. De Bilt e = +33m.7s., MN = +66.0m. Ann Arbor LN = +54.5m. Stonyhurst S = +32m.55s. Toronto e = +31m.1s., eL = +63.6m., iL = +82.2m. Ottawa eE = +34m.8s., e? = +39m.38s., eLE = +50.4m., LE = +63.9m. Washington L = +65.4m. Harvard L = +64.0m. La Paz iPN = +20m.4s., T₀ = 23h.53m.28s.

Feb. 10d. Readings also at 2h. (Vienna), 4h. (near Zurich, Vienna, Florence, and Padova), 5h. (La Paz), 6h. (Taihoku and near Tokyo), 7h. (near Mizusawa), 15h. (Toronto), 18h. (Stonyhurst), 20h. (La Paz).

Feb. 11d. 22h. 39m. 36s. Epicentre 9° 5' N. 84° 0' W. (as on 1918 June 22d.).

A = +.103, B = -.981, C = +.165; D = -.995, E = -.105;
G = +.017, H = -.164, K = -.986.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Balboa Hts.	E.	4.4	96	1 16	+ 8	—	2.3	2.5
	N.	4.4	96	1 18	+10	—	2.1	2.4
	E.	4.4	96	1 27	+19	—	2.6	2.7
	N.	4.4	96	1 19	+11	—	2.2	2.3
Tacubaya	E.	17.7	305	4 27	+14	7 8	-25	—
Georgetown		30.0	11	—	—	—	17.9	—
La Paz		30.4	149	6 15	-17	11 35	- 6	17.6
Chicago		32.4	355	—	—	—	e 14.9	—
Ann Arbor	E.	32.8	0	—	—	—	17.7	—
Harvard	E.	34.8	17	—	—	12 50	- 2	19.5
Ottawa	E.	36.6	10	—	e 13 17	- 1	e 17.4	—
De Bilt		82.0	38	—	—	—	e 41.4	—

Additional readings: Ann Arbor gives also LN = +18.2m. Harvard eE = +16m.12s., LE = +22.9m., T₀ = 22h.37m.22s. Ottawa LE = +19.4m. and +21.4m. De Bilt eLN = +43.4m.

Feb. 11d. Readings also at 17h. (Toronto), 20h. (Manila).

Feb. 12d. Readings at 0h. (Strasbourg), 2h. (Manila), 4h. (Tacubaya (3)), 6h. (Helwan, La Paz, Manila, De Bilt, and Edinburgh), 14h. (near Tacubaya), 21h. (near Tokyo).

Feb. 13d. 20h. 57m. 6s. Epicentre $39^{\circ}0'S$. $17^{\circ}0'W$. (as on 1919 April 16d.).

$A = +.743$, $B = -.227$, $C = -.629$; $D = -.292$, $E = -.956$;
 $G = -.602$, $H = +.184$, $K = -.777$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Cape Town	28.8	91	10 37	?S	(10 37)	-36	—	14.2
La Paz	49.7	282	9 2	-3	16 17	+2	25.9	30.7
Helwan	82.2	42	39 54	?L	—	—	(39.9)	—
Uccle	91.8	13	—	—	—	—	—	49.9
De Bilt	N. 93.1	16	—	—	—	e	49.9	54.8
Colombo	99.6	90	57 54	?L	—	—	(57.9)	59.9
Kodaikanal	99.8	86	54 24	?L	—	—	(54.4)	—

De Bilt gives also $eLE = +64.9m$.

Feb. 13d. Readings also at 5h. (Helwan), 6h. (La Paz), 8h. (near Algiers (2)),
 12h. (La Paz, Batavia, and Manila), 13h. (Helwan and Uccle), 16h.
 (Taihoku and Zi-ka-wei), 21h. (La Paz), 22h. and 23h. (near Tokyo).

Feb. 14d. 1h. 0m. 47s. Epicentre $5^{\circ}0'N$. $132^{\circ}8'E$.

$A = -.677$, $B = +.731$, $C = +.087$; $D = +.734$, $E = +.679$;
 $G = -.059$, $H = +.064$, $K = -.996$.

The epicentre $6^{\circ}0'N$. $132^{\circ}5'E$. of 1914 Oct. 23d. was at first tried but found 1°
 too far north; the above position was deduced from the residuals.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	15.1	310	e 2 59	-41	6 35	+1	7.8	8.6
Taihoku	22.8	333	e 5 7	-8	—	—	—	—
Batavia	28.2	247	4 53	-77	8 50	?	e 15.2	—
Zi-ka-wei	28.3	339	e 5 49	-22	e 10 13	-51	—	—
Osaka	29.8	4	7 19	+53	—	—	—	14.2
Tokyo	31.3	11	e 7 31	+50	(e 11 58)	+2	e 12.0	12.1
Mizusawa	35.0	11	7 19	+6	12 57	+2	—	—
Hakodate	37.4	10	e 7 37	+4	13 29	-1	—	—
Riverview	42.5	156	e 8 12	-3	i 14 42	0	e 23.0	24.2
Sydney	42.5	156	10 25	?PR ₁	15 13	+31	18.4	18.6
Melbourne	44.3	166	—	—	i 15 7	+1	e 23.6	25.3
Colombo	52.7	275	15 13	?S	(15 13)	-99	—	30.2
Kodaikanal	55.1	280	16 25	?S	(16 25)	-57	—	—
Victoria	95.3	40	—	—	—	—	49.2	—
Helwan	97.4	300	23 13	?S	(23 13)	-137	—	—
Hamburg	104.5	329	—	—	—	—	e 51.2	—
De Bilt	E. 107.8	329	—	—	e 25 58	-70	e 53.9	55.9
N. 107.8	329	—	—	—	e 24 43	-145	e 52.5	58.6
Rocca di Papa	108.3	317	19 37	?PR ₁	37 37	?SR ₁	e 54.4	57.2
Uccle	108.9	328	—	—	e 24 43	-155	e 49.2	56.6
Edinburgh	109.2	335	—	—	—	—	51.2	—
Stonyhurst	110.3	331	i 34 43	?SR ₁	—	—	—	67.7
Paris	111.0	326	—	—	e 24 59	-158	55.2	57.2
Oxford	111.1	330	—	—	—	—	42.9	63.9
Barcelona	115.4	320	—	—	—	—	e 57.6	—
Strasbourg	116.4	323	e 21 13	?PR ₁	—	—	54.4	56.3
Tortosa	116.7	320	—	—	—	—	e 59.2	61.6
Chicago	120.5	33	—	—	37 38	?SR ₁	60.2	—
Ann Arbor	122.2	30	—	—	—	—	48.0	—
Coimbra	122.5	324	30 33	?	—	—	e 59.7	—
Toronto	123.4	26	—	—	—	—	e 59.7	—
Ottawa	123.5	21	—	—	—	—	53.2	—
La Paz	156.5	121	20 8	[+ 4]	30 18	?	44.8	46.0

Additional readings: Manila gives also $MN = +8.0m$. Osaka $MN = +15.6m$.
 Mizusawa $PN = +7m.18s$. Riverview $iS = +14m.45s$, $eSR_1 = +17m.51s$,
 $i = +18m.3s$, $MN = +27.4m$, $T_0 = 1h.0m.39s$. Melbourne $iSR_1 =$
 $+13m.49s$. Victoria $e = +47m.43s$, $L = +55.3m$. Helwan $PN =$
 $+22m.13s$. Ann Arbor $LN = +47.8m$. Coimbra $eE = +41m.11s$.
 Toronto $e = +53m.13s$, $eL = +74.7m$. Ottawa $LE = +57.2m$. and
 $+64.2m$.

Feb. 14d. 3h. 0m. 30s. Epicentre $36^{\circ}0'N$. $139^{\circ}0'E$. (as on 1920 Sept. 7d.).

$A = -.611$, $B = +.531$, $C = +.588$.

		Δ	P.	O - C.	S.	O - C.	L.	M.
		$^{\circ}$	m s.	s.	m. s.	s.	m.	m.
Tokyo		0.8	0 9	- 3	—	—	0.4	0.4
Mito		1.3	0 23	+ 3	—	—	0.7	0.8
Nagoya		1.9	0 21	- 8	—	—	0.7	1.1
Osaka		3.2	0 57	+ 7	—	—	1.7	2.6
Kobe		3.4	0 45	- 8	(1 34)	0	1.6	1.8
Mizusawa	E.	3.5	1 1	+ 6	1 47	+10	—	—
	N.	3.5	0 59	+ 4	1 50	+13	—	—
Nagasaki		8.2	4 10	?L	—	—	(4.2)	—
Zi-ka-wei		15.4	e 3 40	- 4	—	—	—	—
De Bilt		83.2	—	—	—	e 45.5	—	—
Eskdalemuir		83.2	—	—	—	59.5	—	—
La Paz		149.0	i 19 51	[- 3]	—	—	—	—

Additional readings: Mito readings have been increased by 1m. Nagoya gives also $LN = +0.8m$. Osaka $MN = +1.8m$. Kobe $MN = +1.9m$.

Feb. 14d. Readings also at 4h. (near Colima), 8h. (near Tokyo), 11h. (Taihoku, Manila, and Lick), 12h. (De Bilt), 15h. (near Tacubaya (7)), 16h. (Rio Tinto), 17h. (La Paz).

Feb. 15d. Readings at 0h. (La Paz), 1h. (Helwan), 5h. (Taihoku), 6h. (La Paz), 10h. (Manila), 12h., 17h., and 18h. (near Tokyo), 20h. (Apia), 23h. (Algiers).

Feb. 16d. Readings at 3h. (La Paz), 6h. (Helwan), 9h. (Manila), 10h. (La Paz and Riverview), 12h. (Apia), 13h. and 16h. (La Paz).

Feb. 17d. Readings at 2h. (Simla, Dehra Dun, Calcutta, and Königsberg), 3h. (De Bilt), 4h. (Helwan), 6h. (La Paz), 7h. (Helwan), 11h. (near Tokyo), 18h. (Apia), 19h. (La Paz), 21h. (near Algiers), 23h. (Denver).

Feb. 18d. Readings at 3h. (Adelaide and near Tokyo), 4h. (Riverview), 5h. (Melbourne and Uccle), 7h. (La Paz), 8h. (Riverview), 12h. (De Bilt, Helwan, Rocca di Papa, and near Athens), 20h. (Rio Tinto).

Feb. 19d. 14h. 33m. 44s. Epicentre $1^{\circ}48'$. $133^{\circ}0'E$. (suggested by Batavia).

$A = -.682$, $B = +.731$, $C = -.024$; $D = +.731$, $E = +.682$;
 $G = +.017$, $H = -.018$, $K = -1.000$.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila		19.9	324	e 4 37	- 3	(8 17)	- 4	8.3	—
Batavia		26.5	259	e 5 52	- 1	i 10 36	+ 4	e 18.6	—
Taihoku		28.6	338	e 6 12	- 2	e 10 28	-42	11.5	12.4
Adelaide		34.0	173	e 6 46	-19	12 40	0	16.4	20.7
Zi-ka-wei		34.4	345	e 6 52	-16	e 12 10	-36	e 14.5	17.4
Perth		34.6	205	4 49	?	12 32	-17	—	—
Fukuoka		35.0	358	e 7 5	- 8	(12 46)	- 9	12.8	15.0
Osaka		36.1	4	7 53	+30	—	—	—	16.8
Riverview		36.6	154	i 7 24	- 3	i 13 15	- 3	e 17.7	24.7
Tokyo		37.6	10	e 8 59	?PR ₁	—	—	—	—
Melbourne		38.0	166	—	—	i 14 10	+32	21.3	22.9
Mito		38.4	10	7 31	-10	13 9	-35	18.4	—
Jinsen		39.4	353	e 5 2	?	8 49	?PR ₁	—	13.5
Ootomari		48.8	10	10 57	?PR ₁	(15 59)	- 5	16.0	—
Calcutta	E.	49.7	304	8 16	-49	15 16	-59	15.3	—
	N.	49.7	304	8 10	-55	15 10	-65	15.2	—

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Colombo	53.7	280	22 16	?SR ₁	—	—	—	—
Wellington	54.8	142 (e 13 16)	?PR ₁	(17 16)	- 3	17.3	32.0	—
Kodaikanal	57.5	283	17 46	?S	(17 46)	- 7	39.4	40.9
Victoria	100.0	41	24 19	?S	32 27	?SR ₁ e 49.0?	54.6	—
Helwan	100.8	300	18 16	?PR ₁	(26 16)	+13	—	—
Konigsberg	103.9	327	—	—	—	e 55.6	—	—
Vienna	108.4	321 e 18 4	?PR ₁	—	—	—	39.3	—
Cape Town	109.4	232	25 46	?S	(25 46)	-97	—	—
Hamburg	110.0	329 e 19 9	?PR ₁	—	—	e 53.3	63.3	—
Rocca di Papa	113.1	315	19 28	?PR ₁	30 24	?	e 58.6	—
De Bilt	113.4	329	—	—	—	—	e 60.2	60.5
Strasbourg	113.6	322 e 19 31	?PR ₁	—	—	e 59.3	—	—
Uccle	114.4	327 e 19 41	?PR ₁	e 29 40	+95	—	62.3	—
Edinburgh	115.1	333 e 30 40	?	39 28	?	54.3	59.4	—
Besançon	115.2	322	19 46	?PR ₁	—	—	61.3	—
Eskdalemuir	115.5	333	18 30	[- 9]	—	—	42.3	58.3
Stonyhurst	116.0	331	18 46	[+ 5]	—	—	—	75.6
Paris	116.4	326	—	—	e 29 37	+76	58.3	63.3
Kew	116.5	330	—	—	—	—	—	77.3
Oxford	116.8	330 e 20 6	?PR ₁	—	—	—	53.7	64.3
Tortosa	121.8	319	20 36	?PR ₁	—	—	e 62.3	67.4
Chicago	125.6	37	27 50	?S	37 50	?	54.9	—
Ann Arbor	127.5	34	—	—	—	—	82.0	—
San Fernando	128.6	318	21 28	?PR ₁	—	—	—	71.8
Toronto	128.9	30	—	—	—	—	77.2	90.8
Ottawa	129.2	25	—	—	e 37 53	?	63.3	—
Harvard	133.6	23	—	—	—	—	e 68.0	—
La Paz	152.5	131 i 20 10	[+10]	34 47	?	76.8	81.1	—

Additional readings and notes: Batavia i = +7m.31s. Epicentre 1°48. 133°0E., as adopted. Adelaide PR₁ = +8m.43s., SR₁ = +14m.10s. Perth readings have been corrected by +2h. Osaka MN = +18.6m. Riverview iS = +13m.27s., and +14m.51s., iSR₂ = +16m.3s., SR₂ = +16m.42s., MNZ = +24.5m. Melbourne SR₁ = +16m.22s. Wellington e = +19m.16s., +23m.58s., and +29m.16s. Helwan readings are given as PE and PN respectively. Konigsberg eLN = +56.8m. Hamburg MN = +59.3m., MZ = +72.3m. De Bilt ePR₁ = +19m.46s., MN = +60.7m. Uccle PR₁ = +21m.58s. Eskdalemuir e = +20m.21s. and +27m.42s. Ann Arbor LN = +81.8m. San Fernando MN = +76.8m. Toronto eL = +83.1m. Ottawa eL = +44.3m. and +77.3m. Harvard L = +71.7m. and +73.9m.

1921. Feb. 19d. 18h. 14m. 30s. Epicentre 3°0S. 139°0E.

A = -.754, B = +.655, C = -.052; D = +.656, E = -.755;
G = +.039, H = -.034, K = -.999.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	25.1	315	e 6 0	+21	(10 33)	+28	10.6	—
Adelaide	32.0	181	e 6 9	-38	12 6	- 2	16.5	21.3
Batavia	32.2	264	e 6 52	+ 2	i 12 31	+20	e 18.9	—
Taihoku	32.7	331	e 6 39	-15	e 11 40	-39	14.3	14.5
Riverview	32.9	162	i 6 46	-10	e 12 9	-13	e 15.9	20.0
Sydney	32.9	162	e 6 48	- 8	12 24	+ 2	17.8	20.5
Melbourne	35.2	172	—	—	e 13 48	+50	—	—
Perth	36.2	215	7 19	- 5	13 2	-11	20.5	22.5
Osaka	37.8	356	6 24	-72	—	—	—	20.2
Kobe	37.8	356	e 7 18	-18	e 12 39	-56	17.6	17.6
Zi-ka-wei	38.1	339	e 7 20	-19	e 13 4	-35	e 17.0	18.9
Tokyo	38.7	0	6 48	-56	6 59	?	7.1	7.1
Mito	39.4	1	7 26	-24	13 27	-30	17.1	18.1
Jinsen	42.1	345	7 51	-21	e 12 4	-152	—	17.5
Mizusawa	E. 42.2	5	7 56	-16	14 7	-31	—	—
	N. 42.2	5	7 48	-24	14 3	-35	—	—
Ootomari	49.7	5	9 24	+19	(16 17)	+ 2	16.3	—
Apia	49.8	105	9 5	- 1	16 42	+26	29.4	29.7
Wellington	50.0	145	e 9 12	+ 5	e 15 54	-25	i 28.1	32.0
Christchurch	50.3	149	24 54	?L	30 18	?	32.6	37.4
Calcutta	E. 55.6	300	9 0	-43	—	—	16.6	—
	N. 55.6	300	8 54	-49	—	—	16.5	—
Colombo	59.9	280	18 30	?S	(18 30)	+ 8	35.5	37.0

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Kodaikanal	62.7	284	10 48	+18	—	—	22.9	38.8
Victoria	97.3	42	24 8	?S (24 8)	—	-81	40.8?	53.2
Berkeley	E. 98.6	52	—	—	c 24 29	-73	e 41.6	—
Lemberg	108.2	322	e 17 54	[-21]	e 27 54	+42	e 60.8	68.0
Tucson	N. 108.5	56	—	—	—	—	e 57.3	—
Konigsberg	108.5	327	26 2	?S (26 2)	—	-73	e 53.7	—
Budapest	112.0	321	i 19 25	?PR ₁	e 30 38	+172	e 63.5	71.5
Cape Town	113.1	230	—	—	—	—	—	64.1
Vienna	113.4	322	18 56	[+24]	29 22	+85	e 61.5	76.5
Hamburg	114.5	329	e 19 30	?PR ₁	e 29 12	+66	e 55.5	65.5
Padova	117.4	320	20 0	?PR ₁	28 28	-1	—	—
Pompeii	117.5	314	20 30	?PR ₁	—	—	—	—
Dyce	117.7	337	—	—	c 29 54	+82	60.5	—
De Bilt	117.8	329	—	—	—	—	e 57.5	62.4
Rocca di Papa	118.4	316	e 19 6	[+18]	—	—	—	72.8
Strasbourg	118.4	325	e 20 1	?PR ₁	28 14	-23	—	74.5
Uccle	118.9	328	20 15	?PR ₁	30 5	+84	e 57.5	68.8
Edinburgh	119.0	336	e 30 10	?S (e 30 10)	—	+88	56.5	70.3
Eskdalemuir	119.5	336	e 20 30	?PR ₁	i 30 13	+87	56.5	—
Stonyhurst	120.2	333	e 20 48	?PR ₁	31 0	+129	62.0	77.5
Kew	120.8	331	29 30	?S (29 30)	—	+35	—	80.5
Paris	121.0	327	e 20 29	?PR ₁	—	—	60.5	73.5
Oxford	121.1	331	20 29	?PR ₁	—	—	55.6	74.3
Chicago	123.1	40	21 0	?PR ₁	30 15	+62	52.5	—
Ann Arbor	125.3	37	—	—	—	—	37.4	—
Barcelona	125.5	320	e 20 50	?PR ₁	—	—	e 63.0	76.7
Tortosa	126.8	321	e 20 52	?PR ₁	—	—	e 60.5	71.2
Toronto	127.0	33	—	—	—	—	e 70.5	80.9
Algiers	127.3	315	e 21 6	?PR ₁	—	—	49.5	79.0
Ottawa	127.8	29	e 21 14	?PR ₁	—	—	e 56.5	—
Ithaca	129.4	32	—	—	—	—	66.0	—
Georgetown	E. 131.3	37	e 19 30	[+ 8]	i 22 55	?PR ₁	65.8	—
Washington	131.3	37	—	—	—	—	55.5	—
Granada	131.6	319	i 22 48	?PR ₁	c 35 22	?	—	—
Harvard	E. 132.3	29	e 22 56	?PR ₁	—	—	e 58.5	—
Coimbra	E. 132.5	325	22 37	?PR ₁	34 59	?	e 55.0	80.0
	N. 132.5	325	22 48	?PR ₁	—	—	e 59.5	83.1
San Fernando	133.7	320	21 12	?PR ₁	—	—	—	84.0
La Paz	146.8	128	i 19 59	[+ 8]	34 3	?	73.5	76.2

Additional readings and notes: Adelaide gives also $PR_1 = +6m.45s.$, $PR_2 = +8m.3s.$, $SR_1 = +13m.48s.$ Batavia $i = +9m.1s.$, $+10m.2s.$, $+10m.38s.$, and $+14m.52s.$ Epicentre $1^{\circ}6S$. $141^{\circ}0E$. Riverview $iP = +6m.41s.$, $iS = +12m.13s.$, $PS = +12m.32s.$, $MZ = +21.5m.$, $MN = +23.3m.$, $T_0 = 18h.14m.21s.$ Osaka $MN = +17.8m.$ Perth readings are given two hours early, and have been corrected as for the earthquake at 14h. Kobe $MN = +19.9m.$ Zi-ka-wei $PR_1E = +8m.57s.$, $PR_1N = +9m.0s.$, $PS = +13m.27s.$, $MN = +20.1m.$ Apia $MN = +30.6m.$ Wellington $iSR_1 = +21m.0s.$ Victoria $S = +31m.30s.$, $iL = +44.8m.$ Konigsberg $PN = +34m.17s.$, $PN? = +43m.17s.$, $eLN = +61.3m.$ and $+65.7m.$ Vienna $iE = +19m.42s.$ De Bilt $ePR_1 = +20m.8s.$, $MN = +74.0m.$ Rocca di Papa $eP = +20m.18s.$ Strasbourg $MN = +74.9m.$ (readings are increased by 1h.). Uccle $MN = +72.2m.$ Edinburgh $S = +40m.15s.$ Eskdalemuir $L = +61.5m.$ Paris $e = +23m.2s.$ and $+32m.52s.$ Ann Arbor long waves at $+60.5m.$ and $+71.1m.$ Toronto $L = +38.4m.$, $eL = +43.1m.$, $L = +57.0m.$, $eL = +75.3m.$, $L? = +135.6m.$ Ottawa $i = +22m.27s.$, $e = +26m.16s.$, and $+28m.9s.$, $eE = +30m.30s.$ and $+41m.30s.$, $eE = +56.5m.$, $L = +76.5m.$ and $+70.5m.$ Granada gives its readings as on 20d. Harvard $iE = +41m.34s.$, $L = +61.5m.$, and $+61.9m.$, $T_0 = 18h.24m.20s.$ Coimbra $eN = +42m.0s.$ San Fernando $MN = +86.0m.$

Feb. 19d. Readings also at 0h. (Manila), 3h. (La Paz), 7h. (near Tacubaya), 8h. (near Tacubaya (8)), 9h. (Wellington), 12h. (Capetown), 15h. (La Paz), 16h. (Taihoku and Uccle), 17h. (Florence and La Paz), 20h. (La Paz and Uccle), 21h. (near Tokyo), 23h. (near Tacubaya (2)).

Feb. 20d. Readings at 3h. and 4h. (La Paz), 5h. (Helwan), 13h. (Taihoku and La Paz), 16h. (near Paris, Strasbourg, Uccle, and De Bilt), 17h. (La Paz (2) and Apia).

Feb. 21d. 2h. 0m. 22s. Epicentre 25°·0N. 70°·7E.

A = +·300, B = +·855, C = +·423 ; D = +·944, E = -·331 ;
G = +·140, H = +·399, K = -·906.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Bombay		6·4	161	1 38	0	2 55	0	e 3·4	3·8
Simla		8·4	42	3 26	?S	(3 26)	-21	—	5·2
Dehra Dun		8·4	49	—	—	—	—	3·6	—
Kodaikanal		16·1	155	—	—	—	—	7·6	10·1
Calcutta		16·3	95	7 2	?S	(7 2)	0	8·7	—
Colombo		20·1	153	—	—	—	—	10·6	11·6
Helwan	N.	35·1	286	16 38	?L	—	—	(16·6)	—
Hamburg		52·9	320	—	e	18 38	+103	—	33·6
De Bilt	E.	55·6	318	—	—	—	—	e 35·6	37·4
	N.	55·6	318	—	—	—	—	e 32·6	36·3
Uccle		56·1	316	—	—	—	—	e 33·6	—
Kew		59·0	317	—	—	—	—	—	40·6
Edinburgh		60·6	322	—	—	—	—	36·6	—
Eskdalemuir		60·6	322	—	—	—	—	35·6	—

Helwan gives also PE = +14m.38s.

Feb. 21d. 11h. 40m. 0s. Epicentre 46°·0N. 130°·0W. (as on 1920 Jan. 2d.).

A = -·447, B = -·532, C = +·719 ; D = -·766, E = +·643 ;
G = -·462, H = -·552, K = -·695.

		Δ	Az.	P.	O-C.	L.	M.
		°	°	m. s.	s.	m.	m.
Victoria		5·2	59	1 21	+ 1	2·6	3·2
Chicago		30 5	82	15 10	?L	(15·2)	—
Ann Arbor	E	33·0	79	—	—	20·1	—
Toronto		35·3	75	—	—	18·6	—
Ottawa		37·1	71	—	—	i 18·8	—
Ithaca		37·8	76	—	—	e 19·4	—
Georgetown		39·0	81	—	—	e 22·4	—
Washington		39·0	81	19 3	?L	(19·0)	—
Eskdalemuir		69·2	29	—	—	35·0	—
Stonyhurst		70·7	30	36 30	?L	(36·5)	—
De Bilt	E.	74·7	27	—	—	e 35·7	43·3
	N.	74·7	27	—	—	e 36·5	38·4

Additional readings : Ann Arbor gives also LN = +19·9m. and LE (Wieschert)
= +20·0m. Georgetown eE? = +15m.0s.

Feb. 21d. 15h. 56m. 30s. Epicentre 52°·0N. 125°·0W.

A = -·353, B = -·504, C = +·788 ; D = -·819, E = +·574 ;
G = -·452, H = -·646, K = -·616.

This determination can only be regarded as rough.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria		3·8	163	1 45	?	4 23	?	8·2	12·1
Sitka	N.	7·8	315	—	—	e 3 20	-11	—	6·0
Berkeley	E.	14·3	171	e 3 18	-12	e 5 53	-22	—	8·4
Lick	E.	14·8	169	e 3 27	-9	—	—	—	—
Denver		18·5	124	—	—	—	—	6·5	12·5
Tucson		22·3	147	5 8	- 1	—	—	14·2	14·8
Chicago		27·0	97	—	—	i 9 18	-83	—	17·3
Ann Arbor	E.	29·2	93	10 12	?	—	—	17·8	20·3
	N.	29·2	93	10 30	?	—	—	17·7	20·8
	E.	29·2	93	10 18	?	15 12	?L	18·0	20·2
Toronto		31·2	88	—	—	e 11 30	-24	i 19·2	19·9
Ottawa		32·5	82	—	—	e 12 15	- 1	—	17·5
Ithaca		33·6	88	—	—	13 1	+27	19·0	—
Northfield		35·0	82	e 10 0	?	—	—	—	—
Georgetown		35·3	93	—	—	e 14 30	+90	e 23·4	24·3
Washington		35·3	93	—	—	e 12 48	-12	—	—
Harvard		36·9	84	e 7 24	- 5	i 13 40	+18	18·6	21·5

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Edinburgh	61.9	34	—	—	—	—	e 31.5	39.2
Eskdalemuir	62.4	34	—	—	—	—	e 31.5	—
Stonyhurst	63.8	36	27 42	?L	32 0	?L	36.5	36.8
Oxford	65.9	36	—	—	—	—	—	40.1
Kew	66.5	35	—	—	—	—	—	41.5
De Bilt	67.8	30	—	—	—	—	e 30.5	43.3
Hamburg	67.9	27	—	—	—	—	e 37.5	45.5
Uccle	68.7	31	—	—	e 25 30	?SR ₁	e 34.5	—
Paris	69.7	35	—	—	e 30 30	?	39.5	42.5
Strasbourg	71.7	30	e 10 14	-74	21 26	+40	43.5	—
Moncalieri	74.8	33	e 9 57	-111	21 46	+22	41.9	48.6
Tortosa	75.4	40	—	—	—	—	e 43.5	52.2
Florence	77.0	30	38 0	?L	—	—	(38.0)	50.5
Rocca di Papa	79.3	30	e 3 54	?	e 22 54	+39	e 46.4	52.4
La Paz	84.3	127	12 47	+ 3	—	—	—	—
Helwan	96.6	20	24 30	?S	(24 30)	-52	(41.5)	—

Additional readings and notes : Victoria gives also $i = +5m.48s.$, $L = +10.8m.$,
 All the observations have been increased by $10m.$, but even now do not fit.
 Berkeley eP?N = $+3m.12s.$ Lick ePN = $+3m.26s.$ Ithaca eE =
 $+15m.34s.$, $L = +39.1m.$ Georgetown SEN? = $+20m.30s.$ Harvard
 $e = +5m.44s.$, $+14m.24s.$, and $+14m.58s.$, $L = +20.5m.$ and $+43.8m.$
 Eskdalemuir $L = +38.5m.$ De Bilt MN = $-44.0m.$ Paris MN =
 $+44.5m.$ Helwan gives its two readings as PN and PE respectively.

Feb. 21d. 19h. 23m. 24s. Epicentre $46^{\circ}0'N. 130^{\circ}0'W.$ (as at 11h.).

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Victoria	5.2	59	1 16	-4	—	—	—	2.8
Berkeley	9.9	142	—	—	—	—	e 6.6	—
Chicago	30.5	82	—	—	e 11 56	+13	—	19.8
Ann Arbor	33.0	79	—	—	—	—	—	21.1
Toronto	35.3	75	—	—	17 30	?L	i 21.9	22.2
Ottawa	37.1	71	—	—	—	—	e 19.4	19.7
Ithaca	37.8	76	—	—	—	—	e 20.0	—
Georgetown	39.0	81	—	—	—	—	e 20.9	—
Washington	39.0	81	—	—	—	—	e 19.9	—
Northfield	39.7	71	—	—	—	—	e 20.1	—
Harvard	E. 41.4	75	—	—	21 48	?L	(21.8)	25.3
Edinburgh	68.8	30	—	—	—	—	—	39.6
Stonyhurst	70.7	30	35 0	?L	—	—	(35.0)	39.6
De Bilt	E. 74.7	27	—	—	—	—	e 34.6	40.1
	N. 74.7	27	—	—	—	—	e 35.6	43.3
Hamburg	74.8	24	—	—	—	—	e 42.6	—
Uccle	75.5	28	—	—	—	—	e 33.6	—
Moncalieri	81.7	29	—	—	e 38 15	?L	43.4	—

Additional readings : Ann Arbor gives also MN = $+20.8m.$ Ithaca e =
 $+23m.17s.$ Georgetown iE = $+21m.51s.$

Feb. 21d. Readings also at 3h. (La Paz), 13h. (Florence and Stonyhurst), 14h (Victoria, Stonyhurst, and Chicago), 15h. (Stonyhurst (2) and Toronto), 16h. (Victoria, Toronto, Northfield, Georgetown, Washington, and De Bilt), 17h. (Stonyhurst), 21h. (Helwan), 23h. (near Mizusawa).

Feb. 22d. Readings at 4h. and 5h. (Helwan), 8h. (near La Paz (2)), 10h. (Apia, near Rocca di Papa, and near Mizusawa), 16h. (La Paz), 22h. (Helwan), 23h. (Apia).

Feb. 23d. Readings at 1h. (Helwan), 3h. (Taihoku and near Tacubaya), 4h. (Manila and La Paz), 5h. (La Paz), 10h. (near Tacubaya (2)), 20h. (Apia), 22h. (La Paz).

Feb. 24d. Readings at 1h. (Apia), 8h. (near Tokyo), 13h. (Apia), 16h. (La Paz, Manila, and near Rocca di Papa and Pompeii), 17h. (Riverview), 21h. (near Tokyo), 22h. (Helwan and Apia).

Feb. 25d. Readings at 1h. (Helwan), 11h. (near Tokyo), 12h. (Taihoku), 15h. (near Mizusawa and Tokyo), 23h. (near Mizusawa).

Feb. 26d. Readings at 5h. (Batavia), 10h. (La Paz), 12h. (near Tokyo), 13h. (Batavia), 15h. (Taihoku).

1921. Feb. 27d. 18h. 23m. 28s. Epicentre 19°0S. 173°0W.

A = -·939, B = -·115, C = -·326; D = -·122, E = +·993;
G = +·323, H = +·040, K = -·946.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Apia		5·3	13	1 23	+ 1	2 24	+ 1	—	3·0
Wellington		24·6	202	i 5 32	- 2	i 9 50	- 5	12·1	14·2
Christchurch		27·3	203	6 20	+19	10 56	+10	12·5	16·5
Riverview		35·1	237	i 7 3	-11	i 12 31	-26	e 14·8	18·7
Sydney		35·1	237	7 8	- 6	12 50	- 7	18·1	19·9
Honolulu	E.	42·9	21	e 8 9	- 8	—	—	18·5	18·7
	N.	42·9	21	e 8 3	-14	e 13 57	-50	e 19·2	23·8
Adelaide		45·5	240	8 29	- 8	15 8	-13	21·2	28·1
Perth		64·5	244	10 6	-36	19 14	- 5	32·7	—
Mito		70·7	323	11 26	+ 5	20 38	+ 4	29·2	31·7
Tokyo		70·7	322	11 24	+ 3	20 41	+ 7	—	22·8
Mizusawa		72·2	326	11 32	+ 1	20 54	+ 2	—	—
Osaka		72·7	319	11 40	+ 6	21 4	+ 6	30·2	35·5
Kobe		72·9	319	11 32	- 3	20 53	- 8	30·5	35·4
Manila		73·2	293	e 11 36	- 1	21 7	+ 3	37·7	38·1
Hakodate		74·3	327	e 11 37	- 7	—	—	—	12·9
Lick	E.	74·3	40	e 11 46	+ 2	e 21 21	+ 3	e 34·5	—
	N.	74·3	40	e 11 45	+ 1	e 21 18	0	e 34·6	—
	V.	75·3	315	e 11 49	- 2	—	—	—	—
Nagasaki		76·8	331	11 56	- 4	(21 36)	-11	21·6	40·2
Ootomari		77·4	305	e 12 7	+ 4	(21 57)	+ 4	33·1	38·7
Taihoku		77·5	60	12 17	+13	20 38	+73	25·1	30·3
Mazatlan	E.	78·5	50	12 7	- 3	22 1	- 5	35·7	37·1
Tucson	E.	78·5	50	e 12 11	+ 1	—	—	e 40·1	—
	N.	78·7	269	12 14	+ 3	i 22 7	- 1	e 32·1	45·1
Batavia		80·5	310	e 12 20	- 2	e 22 30	+ 1	—	39·8
Zi-ka-wei		80·7	30	(i 11 39)	-44	i 11 39	?P	37·2	40·2
Victoria		81·9	66	12 29	- 1	22 41	- 4	37·5	44·9
Tacubaya	E.	83·2	69	12 34	- 3	22 58	- 1	38·0	42·6
Oaxaca		86·4	46	22 32	?S	(22 32)	-62	39·5	52·5
Denver		96·2	84	24 32	?S	(24 32)	-46	—	—
Balboa Heights		96·4	53	—	—	(24 56)	-24	41·2	—
St. Louis	N.	98·0	112	13 51	- 9	i 24 27	-69	41·5	48·0
La Paz		99·2	49	13 44	-22	24 19	-89	42·0	—
Chicago		104·8	290	17 2	+149	25 2	-98	—	—
Calcutta	E.	104·8	290	17 26	+173	26 8	-32	—	—
	N.	105·5	49	—	—	18 20	?PR ₁	e 54·2	61·2
Toronto		106·3	53	e 17 43	+182	26 16	-39	e 37·1	55·2
Georgetown	N.	106·3	53	e 17 43	+182	26 21	-34	e 37·7	58·3
Washington		106·3	53	13 19	-82	24 15	-160	43·7	—
Ithaca		107·3	50	e 18 35	?PR ₁	28 9	+65	46·0	—
Colombo		108·4	272	13 32	-78	18 32	?PR ₁	59·5	82·5
Ottawa		108·4	47	18 29	[+12]	28 28	+74	44·4	—
Northfield		110·4	48	—	—	e 28 32	+60	e 53·5	—
Harvard	E.	111·3	50	e 19 10	?PR ₁	28 51	+71	51·7	67·5
Kodaikanal		111·6	274	18 50	[+23]	—	—	53·7	76·8
Vieques	E.	111·9	78	—	—	—	—	55·4	56·9
	N.	111·9	78	—	—	e 54 32	?	57·7	58·2
Dehra Dun		115·4	296	22 32	?	—	—	—	—
Simla		116·2	297	20 56	?PR ₁	—	—	63·4	64·1
Bombay		118·1	282	20 34	?PR ₁	e 30 19	?	e 57·8	70·2
Cape Town		125·9	192	21 10	?PR ₁	38 27	?SR ₁	64·9	71·4
Dycc		141·2	9	20 3	[+22]	40 51	?SR ₁	68·8	78·2
Edinburgh		142·3	11	26 22	?S	41 20	?SR ₁	—	41·5
Konigsberg		142·7	348	23 19	?PR ₁	—	—	67·8	73·6
Eskdalemuir		142·9	11	19 42	[- 3]	30 12	?	43·5	—
Stonyhurst		144·5	12	i 19 50	[+ 3]	29 26	?	51·5?	115·0
Hamburg		145·3	358	19 43	[- 6]	—	—	c 66·5	88·8
Azores		146·0	49	19 8	[-42]	—	—	—	96·8
Lemberg		146·3	340	e 19 48	[- 2]	e 33 20	?	e 63·3	85·3
De Bilt	E.	146·5	2	e 19 51	[0]	—	—	e 78·5	110·6
	N.	146·5	2	i 19 50	[0]	—	—	e 81·5	83·6

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Oxford	146.6	11	i 19 51	[0]	42 10	?SR ₁	73.5	104.5
Kew	147.1	10	14 32	?	—	—	—	95.5
Uccle	148.1	4	19 49	[- 4]	e 29 55	?	—	83.1
Vienna	149.8	347	e 19 52	[- 4]	e 30 44	?	e 56.5	82.5
Budapest	149.9	344	i 20 29	[+ 33]	e 29 31	?	e 45.0	81.5
Paris	150.0	6	i 20 1	[+ 5]	e 33 44	?	62.5	84.5
Strasbourg	150.4	359	19 52	[- 4]	30 40	?	48.5	91.4
Zurich	151.6	358	e 19 54	[- 4]	—	—	—	—
Besançon	151.8	2	19 59	[0]	30 56	?	76.5	—
Padova	153.3	352	19 56	[- 4]	28 3	?	56.1	89.6
Pola	153.5	349	e 19 41	[- 19]	—	e	83.7	90.6
Moncalieri	154.0	359	19 57	[- 4]	30 42	?	43.7	113.1
Coimbra	155.0	29	19 32	[- 30]	30 12	?	48.9	90.7
Florence	155.0	353	19 54	[- 8]	23 44	?PR ₁	—	91.5
	155.0	353	19 52	[- 10]	24 2	?PR ₁	—	63.5
Helwan	E. 155.4	301	20 26	[+ 24]	—	—	—	121.3
	N. 155.4	301	20 32	[+ 30]	—	—	—	115.2
Marseilles	E. 155.7	3	e 20 9	[+ 6]	e 34 24	?	e 43.5	94.3
Athens	E. 156.1	326	e 19 26	[- 37]	31 8	?	e 55.5	70.0
	N. 156.1	326	e 20 13	[+ 10]	31 4	?	—	93.0
Rocca di Papa	E. 156.7	349	i 20 8	[+ 4]	—	—	42.3	90.8
Barcelona	E. 157.2	9	e 20 1	[- 4]	—	e	64.4	85.8
	N. 157.2	9	—	—	—	e	43.3	83.9
Pompeii	E. 157.3	345	20 7	[+ 2]	30 32	?	46.5	91.5
Tortosa	E. 157.5	13	20 1	[- 4]	32 49	?	58.7	91.6
San Fernando	E. 159.1	31	19 14	[- 53]	—	—	80.6	122.5
Granada	E. 159.6	25	i 20 9	[+ 1]	e 32 21	?	—	—
Algiers	E. 161.9	10	19 57	[- 12]	30 19	?	46.5	104.0

Additional readings and notes: Apia gives also +1m.50s., MV = +8.5m., T₀ = 18h.23m.26s. Epicentre 18° 08'. 175° 0' W. Wellington SR₁ = +10m.32s., SR₂ = +11m.44s. Christchurch readings have been increased by 1h. Riverview IP = +7m.15s. and +8m.42s., PS = +12m.43s., MZ = +18.6m., MN = +19.1m., T₀ = 18h.23m.36s. Epicentre 27° 5'S., 171° 0' W. Honolulu iE = +14m.29s., iN = +14m.28s. Adelaide PR₁ = +10m.17s., PR₂ = +11m.8s., SR₁ = +18m.35s. Tokyo MN = +22.7m. Mizusawa PN = +11m.31s. Osaka MN = +35.9m. All readings given as 19 hrs. Manila PR₁N = +14m.16s., PR₁E = +14m.57s., PR₂N = +16m.51s., PR₂E = +17m.42s., SR₁N = +25m.4s., SR₁E = +25m.45s., SR₂E = +28m.52s., SR₂N = +29m.13s., MN = +37.8m. Kobe MN = +43.2m. Victoria P? = +3m.19s., iL = +22.0m., i = +27m.55s., and +30m.55s. Lick e?E = +30m.31s., e?N = +30m.34s., T₀ = 18h.23m.38s. Nagasaki gives its reading for 26d. Taihoku P is given as an earlier shock, and the adopted S is given as P the recorded S = 27m.8s. Mazatlan gives its readings for 28d. Tucson ePR₁E = +15m.3s. Batavia iP = +12m.16s. Zi-ka-wei SR₁E = +27m.36s., SR₁N = +28m.18s., MN = +39.0m. Denver S = +28m.32s. St. Louis gives both its readings as LN. La Paz iPV = +13m.56s., PR₁N = +17m.44s., and +19m.46s., SR₁ = +30m.38s. and +34m.35s., LN = +44.3m., MN = +48.4m., L rep. = +134.7m., T₀ = 18h.24m.40s. Chicago PR₁ = +17m.52s., L = +41.5m. Toronto S? = +19m.20s., SR₁? = +24m.56s., e = +27m.8s., i = +30m.14s., iSR₁ = +34m.20s., eL = +47.7m., iL = +55.1m. Georgetown ePZ = +17m.48s., SR₁ = +33m.58s., LZ = +51.6m. Washington PR₁ = +17m.43s., L = +53.5m. Ithaca eN = +25m.32s., iE = +34m.11s. Colombo alternative S = +34m.32s., L = +73.5m. Ottawa SR₁ = +34m.10s., SR₂? = +37m.51s., LE = +53.5m., L = +62.5m., T₀ = 18h.29m.56s. Northfield L = +57.5m. Harvard e = +19m.40s., iE = +29m.0s., SR₁ = +35m.33s., LN? = +45.1m., LE = +54.4m., T₀ = 18h.30m.55s. Kodai-kanal L = +29.1m., M = +30.3m. These readings are given for 28d. Dehra Dun readings for this shock are given in G.M.T. instead of local time 5h.30m. E., as is usual. Dyce PR₁N = +22m.51s., PR₁E = +22m.53s., PR₁N = +32m.51s., iN = +35m.23s., MN = +79.6m. Konigsberg LN = +70.2m., LE = +75.9m., and +80.4m. and +86.3m. Eskdalemuir i = +22m.48s., SR₁ = +34m.41s. Stonyhurst S = +41m.56s. alternative. Hamburg i = +29m.38s., e = +41m.32s., MN = +69.5m., MZ = +74.5m. De Bilt iN = +23m.15s. (?PR₁). Uccle iP = +19m.55s., PR₁ = +23m.21s., e = +42m.32s. Vienna iPZ = +19m.56s. and +20m.1s. Budapest i = +35m.28s. Paris PR₁ = +24m.0s., MN = +100.5m. Strasbourg MN = +90.6m., MV = +111.4m. Pola MN = +100.7m., L has been increased by 1h. Moncalieri MN = +108.3m. Coimbra PR₁N = +23m.52s., PR₁E = +24m.46s., eLE = +63.5m., eLN = +65.5m., T₀ = 18h.30m.17s. Epicentre 39° 20' N. 145° 30' E. Athens eE = +20m.20s., i = +20m.32s., +20m.59s., and +21m.41s., PR₂ = +24m.12s., eSR₁N = +37m.28s., eSR₁E = +37m.53s., e = +39m.3s., and +44m.47s. Barcelona PR₁? = +24m.18s. San Fernando MN = +101.5m. Algiers MN = +77.5m.

Feb. 27d. Readings also at 0h. (Apia), 2h. (La Paz), 8h. (Manila), 20h. (Taihoku), 21h. (La Paz).

Feb. 28d. Readings at 2h. (Apia and near Tacubaya), 3h. (Manila), 9h. (Taihoku and near Tokyo), 11h. (Helwan), 13h. (La Paz), 15h. (Riverview), 16h. (Lick and Helwan and near Tacubaya (2)), 21h. (Lick).

Mar. 1d. 6h. 36m. 52s. Epicentre $0^{\circ}0.135^{\circ}0E$. (as on 1919 Nov. 23d.).

$$A = -.707, B = +.707, C = .000; \quad D = +.707, E = +.707; \\ G = .000, H = .000, K = -1.000.$$

Very doubtful. The Riverview L and M suggest that the epicentre is much nearer Riverview so that the reading $+7m.50s.$ really belongs to S. But this is inconsistent with the readings for Manila and Batavia, unless we assume a very deep focus, which is not supported by the La Paz observation.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	20.1	317	e 4 28	-14	—	—	—	—
Taihoku	28.2	334	—	—	—	—	14.7	—
Batavia	28.8	257	e 6 2	-14	—	—	i 14.2	—
Osaka	34.7	1	7 10	-1	—	—	—	22.4
Adelaide	35.1	175	—	—	(11 38?)	-79	11.6?	15.3
Riverview	37.1	159	(e 7 50)	+19	e 7 50	?P	e 10.6	14.0
Wellington	54.7	144	e 11 38	?PR ₁	e 15 20	?	e 20.3	—
Victoria	97.8	41	—	—	—	—	40.6	44.1
Hamburg	109.9	329	—	—	—	—	e 65.1	—
De Bilt	E. 113.2	329	—	—	e 38 29	?	e 55.1	67.8
	N. 113.2	329	—	—	—	—	e 57.1	69.2
Rocca di Papa	113.5	317	—	—	—	—	e 69.9	73.5
Uccle	114.3	328	—	—	—	—	e 54.1	80.1
Chicago	123.3	37	—	—	—	—	e 54.6	—
Toronto	126.7	30	—	—	—	—	61.2	72.6
La Paz	151.8	127	20 8 [+ 9]	—	—	—	—	—

Additional readings and notes: Batavia gives $i = +6m.12s.$ Osaka readings are corrected by $+10m.$ Riverview $eP? = +4m.26s.,$ MN = $+17.9m.$ Chicago L = $+58.4m.$

Mar. 1d. Readings also at 2h. (La Paz and near Tokyo and Mizusawa), 4h. (Helwan), 10h. (near Oaxaca), 13h. (Helwan), 14h. (Pompeii), 19h. (near Batavia), 21h. (Manila), 22h. (near La Paz).

Mar. 2d. Readings at 6h. and 8h. (La Paz), 11h. (La Paz), 12h. (Wellington and near Batavia), 15h. (Tacubaya), 17h. (La Paz and Tacubaya).

1921. Mar. 3d. 3h. 2m. 15s. Epicentre $38^{\circ}0N. 141^{\circ}5E.$

$$A = -.617, B = +.490, C = +.616; \quad D = +.622, E = +.783; \\ G = -.482, H = +.383, K = -.788.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E. 1.2	345	0 31	+13	0 50	+17	—	—
	N. 1.2	345	0 32	+14	1 3	+30	—	—
Mito	1.8	206	0 38	+10	—	—	1.0	1.6
Tokyo	2.8	211	0 42	-2	(1 8)	-9	1.1	—
Hakodate	3.8	352	1 14	+15	—	—	2.0	3.5
Osaka	5.9	238	1 37	+6	—	—	3.2	4.3
Kobe	E. 6.2	239	1 36	+1	2 13	-36	3.1	4.6
	N. 6.2	239	1 36	+1	2 24	-25	3.1	4.0
Ootomari	8.7	5	1 57	-15	(3 53)	-3	3.9	6.5
Zi-ka-wei	17.9	254	4 16	0	e 7 39	+1	—	12.2
Taihoku	21.3	239	—	—	e 9 1	+11	—	—
Manila	29.7	223	e 6 8	-17	—	—	13.3	13.4

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta	E.	47.8	269	8 15	-38	17 3	+72	28.6	—
	N.	47.8	269	8 15	-38	16 57	+66	—	—
Batavia		54.7	225	8 45	-52	18 31	+74	34.8	—
Kodaikanal		63.4	265	40 21	?	—	—	43.2	46.2
Colombo		63.6	260	39 45	?L	—	—	(39.8)	46.8
Victoria		65.6	44	—	—	(20 20)	+48	20.3	38.5
Riverview		72.4	171	e 12 0	+28	i 20 43	-12	e 31.6	42.6
Konigsberg		74.3	330	11 44	0	22 27	+69	e 38.6	—
Melbourne		75.9	177	—	—	i 22 9	+33	e 39.4	44.8
Lemberg		76.4	324	—	—	—	—	e 35.8	49.0
Hamburg		79.4	333	i 12 14	-1	—	—	e 41.8	44.8
Budapest		80.3	325	e 13 55	+94	e 17 3	?PR ₁	e 43.2	45.8
Vienna	Z.	81.0	328	i 12 24	-1	—	—	—	53.0
Edinburgh		81.4	341	—	—	—	—	40.8	52.8
De Bilt	E.	82.2	334	—	—	e 22 33	-15	e 37.8	47.5
	N.	82.2	334	—	—	e 22 41	-7	e 39.8	52.0
Stonyhurst		83.0	339	e 17 3	?PR ₁	e 23 15	+18	43.2	54.8
Uccle		83.6	334	12 36	-4	22 56	-9	e 37.8	53.4
Strasbourg		84.2	331	12 39	-4	e 23 3	-7	e 41.8	49.0
Kew		84.5	338	—	—	—	—	—	53.8
Pola		84.6	326	e 12 27	-19	e 23 15	0	e 43.9	53.8
Wellington		84.9	155	e 17 51	?PR ₁	e 23 27	+9	e 44.2	—
Padova		85.1	328	12 43	-6	23 19	-1	—	50.9
Paris		85.9	335	i 12 48	-5	i 23 34	+5	44.8	53.8
Helwan		86.0	307	15 45	?	—	—	—	—
Besançon		86.0	332	12 53?	0	23 16	-14	46.8	—
Florence		86.6	327	11 15?	?	—	—	—	49.2
Moncalieri		87.2	330	12 20	-40	22 34	-69	e 41.0	52.2
Pompei	E.	87.5	323	12 45	-17	22 45	-62	56.8	—
Rocca di Papa		87.6	325	i 13 57	+54	i 23 45	-3	e 48.2	59.6
Chicago		88.5	33	23 45	?S	(23 45)	-13	44.8	—
Ottawa		90.1	24	—	—	i 23 56	-19	e 43.2	—
Toronto		90.3	27	—	—	—	—	46.2	—
Barcelona		92.4	330	—	—	e 24 11	-28	e 50.4	59.7
Tortosa		93.4	332	—	—	—	—	e 44.8	61.5
Harvard		94.3	23	—	—	(e 30 20)	?	52.4	—
Algiers		95.9	328	e 12 42	-66	23 5	-130	e 40.8	53.2
Coimbra		97.0	338	—	—	38 45	?	52.6	—
Granada		98.2	333	17 52	?PR ₁	e 28 54	?	—	—
San Fernando		99.8	335	—	—	—	—	55.2	63.2
La Paz		146.2	59	i 19 51	[+ 1]	e 33 59	?	71.2	72.1

Additional readings: Hakodate gives also MN = +3.4m. Osaka MN = +3.5m. Zi-ka-wei PME = +4m.52s. ?PR₁. Manila MN = +14.9m. Batavia i = +9m.34s., +10m.42s., +12m.32s., +16m.14s., and +17m.8s. Riverview iS = +20m.49s., PS = +21m.37s., MZ = +34.0m., MN = +42.0m. Konigsberg eLE = +38.7m., +46.9m., and +48.8m. Lemberg +48m.9s. Hamburg MN = +51.0m., MZ = +53.0m. Budapest e = +24m.21s. Uccle SR₁ = +29m.11s., MN = +52.2m. Strasbourg PS = +23m.27s. Pola MN = +53.9m. Wellington e = +24m.27s. and +29m.51s. Padova SR₁ = +23m.36s. Paris MN = +50.8m. Helwan PN = +16m.45s. Moncalieri MN = +55.9m. Rocca di Papa eP = +14m.33s. Chicago PR₂? = 29m.30s., S? = +32m.10s., L = +49.8m. Ottawa LE = +52.8m. Harvard L = +59.8m. All readings are given as on 2d. Toronto i = +28m.39s. and +35m.45s., L = +54.2m.

Mar. 3d. 8h. 20m. 40s. Epicentre 6°.5S. 107°.5E.

A = -.299, B = +.948, C = -.113; D = +.954, E = +.301;
G = +.034, H = -.108, K = -.994.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	0.7	295	i 0 45	+34	—	—	—	1.3
Manila	25.0	32	i 5 38	0	—	—	10.5	11.2
Perth	26.6	164	5 49	-5	10 39	+6	12.5	—
Colombo	30.7	297	5 20	-75	—	—	9.3	11.3
Kodaikanal	34.3	300	13 14	?S	(13 14)	+30	15.0	23.5
Taihoku	34.4	23	e 7 20	+12	—	—	—	—
Calcutta	34.6	329	6 2	-68	13 44	+55	19.4	24.4
Zi-ka-wei	40.0	19	i 7 52	-3	14 2	-5	—	25.0
Adelaide	40.3	139	(7 56)	-1	(13 59)	-12	24.2	28.6

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Melbourne		46.2	139	e 8 44	+ 3	i 15 32	+ 1	e 24.0	32.2
Simla		47.5	324	—	—	e 15 26	-22	—	29.9
Riverview		48.7	130	e 8 56	- 2	i 16 9	+ 7	e 25.5	31.6
Sydney	E.	48.7	130	8 32	-26	18 56	?SR ₁	31.3	31.9
Osaka		48.9	29	8 38	-21	(16 13)	+ 8	16.2	18.5
Tokyo		51.9	32	e 7 2	-137	—	—	—	—
Mizusawa	E.	55.2	31	9 46	+ 6	17 26	+ 2	—	—
	N.	55.2	31	9 45	+ 5	17 31	+ 7	—	—
Wellington		68.8	132	e 14 2	?PR ₁	e 20 26	+14	40.5	43.3
Helwan		81.4	304	12 32	+ 5	—	—	—	—
Cape Town		85.6	236	—	—	—	—	—	100.4
Pompeii	E.	96.5	311	23 50	?S	(23 50)	-91	—	—
Rocca di Papa		98.0	312	e 21 50	?	—	—	e 57.6	67.0
Moncalieri		101.4	316	e 23 5	?S	(e 23 5)	-184	52.8	—
De Bilt	E.	102.7	323	—	—	e 25 14	-67	e 56.3	58.1
	N.	102.7	323	—	—	e 25 20	-61	e 55.3	63.1
Uccle		103.3	321	—	—	—	—	—	57.3
Paris		104.7	320	—	—	—	—	e 57.3	67.3
Algiers		105.4	309	e 18 16	?PR ₁	27 20	+34	61.8	—
Stonyhurst		106.9	325	c 29 2	?S	37 20	?	65.0	76.8
Edinburgh		106.9	327	—	—	—	—	—	63.3
Coimbra		113.8	312	—	—	—	—	e 62.3	—
Victoria		120.0	35	—	—	—	—	60.0	79.2
Ottawa		141.0	2	—	—	i 41 5	?SR ₁	e 62.8	—
Chicago		142.2	17	41 13	?SR ₁	—	—	e 63.7	—
Toronto		142.3	6	—	—	—	—	82.4	87.2
Harvard	E.	144.1	359	—	—	i 41 36	?SR ₁	e 65.7	77.8
Georgetown		147.3	5	—	—	e 41 4	?SR ₁	—	—
La Paz		156.6	191	i 20 5	[+ 1]	34 37	?	75.3	78.8

Additional readings: Manila gives also MN = +11.0m. Calcutta LN = +19.5m., other phases being same in both components. Zi-ka-wei MN = +27.6m. Adelaide gives P as S and S as SR₁, also P = 8h.17m.21s., SR₂ = +17m.20s., SR₃ = +21m.20s. Melbourne SR₁ = +19m.14s. Riverview PS = +16m.32s. Wellington e = +37m.56s. Helwan PN = +19m.56s. Moncalieri S? = +40m.37s. Paris MN = +59.3m. Ottawa L = +74.3m. and +85.3m. Georgetown eN = +40m.53s. Harvard L = +70.5m. and +93.7m.

Mar. 3d. Readings also at 3h. (near Tokyo), 4h. (near Tacubaya), 7h. (Zi-ka-wei), 8h. (Taihoku), 20h. (Wellington), 21h. (Helwan).

Mar. 4d. 12h. 50m. 58s. Epicentre 29° 0' N. 139° 0' E.

A = -.660, B = +.574, C = +.485; D = +.656, E = +.755;
G = -.366, H = +.318, K = -.875.

A depth of focus 0.060 is assumed.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Osaka	+0.2	6.4	333	1 38	- 3	(2 48)	-12	2.8	3.8
Kobe	+0.1	6.5	332	1 36	- 5	(2 56)	- 4	2.9	3.5
Tokyo	+0.1	6.7	5	1 38	- 6	2 12	-53	2.9	2.9
Mizusawa	-0.7	10.3	9	2 16	- 8	4 4	-14	—	—
Zi-ka-wei	-1.6	15.3	283	e 3 13	- 9	—	—	—	—
Taihoku	-1.7	16.0	260	e 3 31	+ 1	—	—	—	—
Manila	-2.7	22.0	233	e 4 22	-11	8 20	+12	9.8	10.8
Batavia	-5.2	46.8	226	7 51	-17	13 59	-30	—	—
Helwan	E. -7.5	89.4	304	22 2	?S	(22 2)	-43	—	—
La Paz	—	152.1	69	19 7	[-52]	—	—	—	—

Additional readings: Osaka gives also MN = +3.6m. Kobe MN = +3.2m. Mizusawa SN = +4m.3s. Taihoku e = +5m.12s. Manila MN = +10.1m. Helwan PN = +21m.2s.

Mar. 4d. Readings also at 0h. (Zi-ka-wei), 1h. (near Tokyo and Mizusawa), 5h. (near Padova, Florence, and Rocca di Papa), 11h. (La Paz), 14h. (Nagasaki), 20h. (Rocca di Papa), 21h. (La Paz).

Mar. 5d. 6h. 24m. 8s. Epicentre $7^{\circ}0'N. 94^{\circ}0'E.$ (as on 1915 Aug. 12d.).

A = -069, B = +990, C = +122; D = +998, E = +070;

G = -009, H = +122, K = -993.

Very rough determination.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Colombo		14.1	268	6 52	?	7 40	?L	8.9	10.5
Calcutta	N.	16.4	341	3 58	+1	8 34	+90	13.3	16.3
Kodaikanal		16.7	283	—	—	—	—	8.4	11.5
Batavia		18.3	135	e 4 27	+6	—	—	—	11.3
Manila		27.5	72	e 6 8	5	11 24	+34	14.5	16.1
Simla		28.8	329	e 6 10	-6	—	—	—	16.1
Taihoku		31.9	50	—	—	e 11 52	-15	—	21.2
Zi-ka-wei		35.2	43	e 7 2	-13	e 12 30	-28	e 15.7	20.2
Perth		44.2	153	10 32	?PR ₁	—	—	—	—
Kobe	E.	46.8	48	e 18 47	?SR ₁	—	—	27.4	—
	N.	46.8	48	17 21	?SR ₁	—	—	26.0	—
Osaka		47.0	48	8 59	+12	—	—	—	33.0
Melbourne		65.2	137	—	—	e 29 52	?	e 35.2	41.4
Riverview		67.7	130	—	—	e 30 16	?	e 35.0	44.0
Sydney	E.	67.7	130	—	—	36 16	?L	40.9	44.4
Vienna		76.5	320	11 54	-4	—	—	—	51.9
Rocca di Papa		78.9	311	e 12 6	-6	—	—	e 51.3	—
Moncalieri		82.5	315	e 20 38	?	29 35	?SR ₁	39.2	—
De Bilt		83.8	323	—	—	e 23 16	+9	e 40.9	55.1
Uccle		84.3	322	—	—	e 27 52	?SR ₁	e 43.9	—
Kew		87.2	322	—	—	—	—	—	64.9
Wellington		87.8	132	—	—	—	—	e 42.2	—
Stonyhurst		88.1	324	24 22	?S	(24 22)	+29	—	59.9
Rio Tinto		93.9	310	53 52	?L	—	—	(53.9)	64.9
Victoria		115.6	25	—	—	—	—	68.9	81.7
Ottawa		126.8	350	—	—	e 42 43	?SR ₁	60.4	—
Toronto		129.0	353	—	—	—	—	65.2	—
Chicago		131.2	1	—	—	—	—	i 64.5	—
La Paz		160.2	240	20 18	[+10]	34 37	?	84.4	95.5

Additional readings: Calcutta gives also PE = +4m.4s. Manila MN = +17.5m. Zi-ka-wei MN = +20.4m. Perth gives its reading as on 4d. Osaka MN = +33.9m. Melbourne SR₁ = +32m.52s. Riverview e? = +25m.10s., MN = +38.5m., MZ = +44.4m. Rocca di Papa L = +20.3m. De Bilt MN = +47.1m. Eskdalemuir ($\Delta = 88^{\circ}2$, Az. = 326°) gives just 7h. to 8h. Ottawa eLE = +54.6m., L = +75.9m. Toronto eL = +67.6m.

Mar. 5d. Readings also at 0h. (Manila), 1h. (Lick), 5h. (Wellington), 8h. (Perth), 19h. (Helwan), 20h. (Wellington), 22h. (near Tacubaya), 23h. (La Paz and near Tacubaya).

1921. Mar. 6d. 7h. 24m. 50s. Epicentre $26^{\circ}5'N. 109^{\circ}0'W.$

A = -291, B = -846, C = +446; D = -946, E = +326;

G = -145, H = -422, K = -895.

A height of focus has been assumed, 0.020.

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mazatlan	E.	-0.1	4.0	143	—	—	(2 54)	+67	2.9	4.4
Tucson	E.	0.0	6.0	345	—	—	—	—	e 3.1	3.8
	N.	0.0	6.0	345	—	—	e 3 23	?	e 3.7	5.2
Tacubaya	E.	+0.3	11.4	126	3 15	+20	5 55	+43	6.5	8.8
Oaxaca	E.	+0.5	14.7	127	3 51	+9	6 51	+14	8.0	9.2
Lick	E.	+0.5	15.2	319	e 3 50	+2	—	—	e 7.1	10.3
	N.	+0.5	15.2	319	e 3 54	+6	—	—	e 7.2	10.4
Berkeley	E.	+0.6	16.0	319	e 3 58	-2	e 7 13	+4	e 8.2	10.1
	N.	+0.6	16.0	319	e 3 55	-5	e 7 14	+5	e 8.1	10.5
	V.	+0.6	16.0	319	e 3 58	-2	e 7 13	+4	e 8.2	11.7
St. Louis		+0.8	19.8	48	e 4 4	-44	8 10	-26	10.6	11.2
Chicago		+1.0	23.2	44	5 38	+8	10 0	+12	12.1	15.9

Continued on next page.

	Corr. for Focus	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Victoria	+1.1	24.6	337	9 15	?S	(9 15)	-61	12.9	16.1
Ann Arbor	Z. +1.1	24.6	337	5 40	- 5	—	—	14.2	16.7
	+1.2	26.0	46	—	—	10 52	+ 7	15.1	16.7
Georgetown	+1.2	26.0	46	—	—	10 46	+ 1	15.1	16.9
	E. +1.4	29.4	57	e 6 34	- 2	e 11 56	+ 8	e 17.0	19.6
Washington	N. +1.4	29.4	57	—	—	e 11 46	- 2	e 17.0	19.4
	+1.4	29.4	57	6 6	-30	11 13	-35	e 15.7	—
Toronto	+1.4	29.4	47	6 46	+10	11 40	- 8	i 16.8	17.5
Cheltenham	E. +1.4	29.5	57	e 16 25	? L	—	—	(e 16.4)	19.8
	N. +1.4	29.5	57	e 16 20	? L	—	—	(e 16.3)	19.2
Ithaca	+1.4	30.9	49	—	—	e 11 46	-27	e 16.7	—
Fordham	E. +1.5	32.3	53	11 58	?S	(11 58)	-40	20.9	—
Ottawa	+1.5	32.5	46	7 1	- 4	12 33	- 7	e 16.7	21.5
Northfield	+1.6	34.1	48	—	—	—	—	e 16.7	—
Harvard	E. +1.6	34.6	51	7 18	- 6	13 5	- 8	e 18.2	22.8
Honolulu	E. +1.9	44.8	276	—	—	—	—	e 20.0	24.0
	N. +1.9	44.8	276	—	—	—	—	e 18.7	23.0
La Paz	+2.4	58.5	133	10 22	+ 4	e 18 28	- 7	28.2	31.7
Edinburgh	+2.6	76.5	33	—	—	—	—	41.2	43.8
Eskdalemuir	+2.6	76.8	33	—	—	—	—	36.2	41.0
Stonyhurst	+2.7	77.9	36	e 22 40	?S	(e 22 40)	+10	—	47.7
Kew	+2.7	80.2	37	—	—	—	—	—	49.2
De Bilt	E. +2.7	82.7	33	—	—	23 25	+ 2	e 38.2	50.2
	N. +2.7	82.7	33	—	—	23 20	- 3	—	54.1
Rio Tinto	+2.7	83.0	50	40 10	? L	—	—	(40.2)	49.2
Uccle	+2.7	83.0	36	e 12 49	- 3	e 23 17	-10	e 37.2	52.7
Paris	+2.7	83.1	38	—	—	e 23 11	-17	41.2	45.2
San Fernando	+2.7	83.9	51	—	—	—	—	40.9	50.2
Hamburg	+2.7	84.2	30	—	—	—	—	e 41.2	52.9
Besançon	+2.7	86.0	37	—	—	—	—	45.2	—
Strasbourg	+2.7	86.1	36	—	—	—	—	e 37.2	50.9
Tortosa	+2.7	86.2	44	—	—	—	—	e 41.2	45.0
Barcelona	+2.7	86.9	43	—	—	—	—	e 43.0	—
Königsberg	+2.8	87.9	26	—	—	—	—	e 48.8	—
Moncalieri	+2.8	88.2	38	e 24 17	?S	(e 24 17)	- 7	44.3	53.9
Algiers	+2.8	90.1	46	—	—	e 24 4	-40	47.2	53.5
Vienna	+2.8	90.7	31	—	—	—	—	e 38.2	54.2
Florence	+2.8	90.9	38	35 10	?	—	—	—	47.2
Budapest	+2.8	92.6	30	—	—	—	—	e 45.2	64.2
Manila	—	116.4	304	—	—	—	—	e 57.2	—
Perth	—	140.8	250	—	—	—	—	57.3	—

Additional readings: Ann Arbor gives (Bosch-Omori) MN = +16.5m. (Wiechert) LN = +14.7m. Toronto iL = +18.8m. and eL = +38.9m. Cheltenham iN = +16m.50s., eE = +18m.42s. Ithaca L = +17.6m. Ottawa MN = +20.0m., L = +25.2m., I_L (rep.) = 9h.2m., T_0 = 7h.24m.52s. Harvard LE = +19.4m. and +40.4m., T_0 = 7h.24m.52s. La Paz MN = +39.6m., T_0 = 7h.25m.20s. Uccle MN = +49.7m. Paris e = +35m.10s. MN = +42.2m. San Fernando MN = +46.7m. Hamburg MN = +52.0m., MZ = +56.9m. Strasbourg MN = +46.4m. Königsberg eLN = +51.0m. and +53.0m., LE = +53.3m., LN = +53.5m., and +57.5m. Moncalieri S? = +34m.7s., MN = +52.8m.

Mar. 6d. Readings also at 1h. (near Osaka, Mizusawa (2), and Tokyo), 4h. (near Osaka), 6h. (Wellington), 7h. (Riverview), 9h. (La Paz and near Tacubaya and Oaxaca), 19h. (Denver), 20h. (La Paz and Helwan), 23h. (Wellington).

Mar. 7d. Readings at 5h. (La Paz), 14h. (La Paz and near Tokyo).

Mar. 8d. Readings at 3h. (La Paz), 4h. (Barcelona), 5h. (Algiers), 7h. (Denver), 10h. (Marseilles), 11h. (Taihoku), 15h., 17h., and 18h. (La Paz).

Mar. 9d. Readings at 9h. (La Paz), 11h. (Helwan), 14h. (La Paz), 15h. (Helwan), 16h. (Tokyo and Osaka), 17h. (Rio Tinto), 20h. (La Paz), 22h. (Batavia).

Mar. 10d. 20h. 5m. 8s. Epicentre $11^{\circ}\text{--}0\text{S. } 160^{\circ}\text{--}0\text{E.}$

$$A = -.922, B = +.336, C = -.191; \quad D = +.342, E = +.940; \\ G = +.179, H = -.065, K = -.982.$$

Very doubtful.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview		24.2	198	e 5 33	- 3	e 9 53	+ 5	e 12.7	15.9
Sydney	E.	24.2	198	9 58	?S	(9 58)	+10	14.0	15.1
Melbourne		30.0	205	—	—	—	—	e 13.7	—
Adelaide		30.8	218	6 28	- 8	11 34	-14	14.5	21.5
Wellington		33.0	160	e 12 16	?S	(e 12 16)	- 8	17.8	18.7
Perth		45.7	237	6 20	?	11 38	?	18.0	—
Honolulu	E.	52.4	51	—	—	—	—	e 26.8	28.9
	N.	52.4	51	—	—	—	—	e 22.7	28.5
Batavia		52.7	272	i 9 4	-20	i 16 11	-41	—	—
Victoria		89.6	40	—	—	—	—	43.0	47.5
Toronto		119.6	43	—	—	e 39 10	?SR ₁	68.6	—
Ottawa		121.6	41	—	—	—	—	e 59.9	—
La Paz		125.0	119	19 27	[+21]	—	—	—	—
Helwan	E.	128.8	301	32 52	?	—	—	—	—
De Bilt		134.2	340	—	—	—	—	e 66.9	—
Uccle		135.5	340	—	—	—	—	e 59.9	—
Algiers		146.9	326	e 20 33	?PR ₁	—	—	—	21.5

Additional readings: Riverview gives also iS = +9m.57s., PS = +10m.17s.,
MN = +14.2m., MZ = +16.6m. Sydney S = +12m.40s. All these
readings are given at 21h. Adelaide SR₁ = +12m.52s. Batavia i =
+12m.18s. Toronto L = +94.7m. Ottawa L = +74.9m. and +84.9m.
Helwan PN = +36m.52s.

Mar. 10d. Readings also at 19h. (Stonyhurst), 20h. (Manila and Adelaide), 22h. (Lick).

Mar. 11d. Readings at 9h. (near Mizusawa), 16h. (Manila), 17h. (De Bilt and Uccle), 19h. (Manila, La Paz, and Riverview), 20h. (Helwan), 21h. (near Mizusawa), 22h. (Manila), 23h. (Wellington and near Apia).

Mar. 12d. 10h. 30m. 24s. Epicentre $7^{\circ}\text{--}0\text{N. } 82^{\circ}\text{--}5\text{W.}$ (as on 1921 Jan. 20d.).

$$A = +.130, B = -.984, C = +.122; \quad D = -.991, E = -.131; \\ G = +.016, H = -.121, K = -.992.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Balboa Hts.	E.	3.5	55	0 59	+ 4	—	—	2.0	3.4
	N.	3.5	55	0 58	+ 3	—	—	2.0	3.6
Oaxaca	E.	17.2	307	4 31	+27	8 12	+50	9.4	9.9
Tacubaya	E.	20.4	309	4 59	13	9 8	+36	10.8	12.4
La Paz		27.4	149	5 59	- 3	10 43	- 5	13.6	15.4
Georgetown		32.3	8	—	—	12 0	-13	e 15.9	—
Chicago		35.1	353	7 4	-10	12 24	-33	15.9	—
Ann Arbor	E.	35.3	359	—	—	13 54	+54	19.8	—
	N.	35.3	359	—	—	14 6	+66	19.9	—
Ithaca		35.8	7	—	—	e 8 6	?PR ₁	e 16.5	—
Toronto		36.7	4	—	—	13 48	+28	e 17.3	22.1
Harvard	E.	36.8	14	—	—	—	—	e 15.6	—
Ottawa		38.8	7	7 1	-43	13 34	-15	e 19.6	—
Victoria		53.2	330	28 24	?L	—	—	31.4	32.8
Rio Tinto		74.5	52	36 36	?L	—	—	(36.6)	60.6
Eskdalemuir		78.1	35	—	—	—	—	36.1	—
Kew		79.7	39	—	—	—	—	—	56.6
Tortosa		80.2	49	—	—	—	—	e 33.6	38.6
Paris		81.5	42	—	—	—	—	e 38.6	—
Uccle		82.6	40	—	—	—	—	e 34.6	42.6
De Bilt	E.	83.0	40	—	—	e 28 36	?SR ₁	e 38.6	47.4
	N.	83.0	40	—	—	—	—	e 34.6	37.3
Rocca di Papa		89.2	48	24 6	?S	(24 6)	+ 1	34.6	—
Helwan		106.8	56	28 36	?S	(28 36)	+97	(51.6)	—

Additional readings: Georgetown gives also L = +17.7m. Harvard PR₁E?
= 10h.4m.30s., S?E = 10h.30m.42s., iE = +2m.4s., L = +18.3m. Ottawa
LE = +21.6m. and +27.6m., T₀ = 10h.29m.8s. Ann Arbor (Wiechert),
LN = +19.6m. Toronto iL = +20.1m. Victoria iL = +34.7m.
Eskdalemuir LN = +33.1m.

Mar. 12d. Readings also at 2h. (Helwan and near Berkeley and Lick), 6h. (La Paz and Taihoku), 8h. (La Paz and Helwan), 15h. (near Osaka), 17h. (near Taihoku).

Mar. 13d. Readings at 0h. (Manila and near La Paz), 1h. (La Paz (2)), 2h. (Batavia and Manila), 5h. (near Tacubaya), 15h. (near Mizusawa), 16h. (La Paz), 21h. (La Paz).

Mar. 14d. Readings at 17h. (near Tokyo), 18h. (Lick), 23h. (La Paz and Manila).

Mar. 15d. 4h. 31m. 40s. Epicentre $33^{\circ}2'N$. $138^{\circ}0'E$. (as on 1920 Dec. 27d.).

$$A = -.622, B = +.560, C = +.548.$$

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Osaka		2.6	0 50	+ 9	—	—	—	1.7
Kobe	E.	2.8	0 48	+ 4	—	—	2.2	2.8
	N.	2.8	0 47	+ 3	—	—	2.2	2.5
Tokyo		2.8	0 49	+ 5	(1 5)	-12	1.1	2.5
Mizusawa	E.	6.4	1 32	- 6	2 43	-12	—	—
	N.	6.4	1 44	+ 6	2 56	+ 1	—	—

Osaka gives also $MN = +2.5m$.

Mar. 15d. Readings also at 0h. (Wellington), 2h. and 3h. (La Paz), 4h. (Helwan), 5h. (Tokyo and Wellington), 9h. (near Oaxaca and Tacubaya), 14h. (Batavia and Helwan), 16h. (La Paz), 20h. (La Paz, Calcutta, Hamburg, Rocca di Papa, Stonyhurst, and De Bilt), 21h. (Manila), 22h. (Melbourne, Wellington, Riverview, Sydney, and Christchurch).

Mar. 16d. 11h. 36m. 40s. Epicentre $13^{\circ}0'S$. $138^{\circ}0'E$.

$$A = -.724, B = +.652, C = -.225; \quad D = +.669, E = +.743; \\ G = +.167, H = -.151, K = -.974.$$

Compare $13^{\circ}0'S$. $136^{\circ}0'E$. as on 1918 Mar. 10d. and Dec. 28d.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview		24.0	152	e 5 20	- 8	e 9 30	- 14	e 12.0	13.7
Melbourne		25.6	167	—	—	10 2	-12	13.1	19.3
Batavia		31.4	279	e 7 27	+45	—	—	i 14.1	—
Manila		32.3	328	e 6 48	- 3	—	—	—	—
Wellington		42.7	137	—	—	e 12 2	?	—	20.3
Victoria		105.4	40	—	—	—	—	—	47.3
Chicago		131.2	43	—	—	—	—	63.3	—
Ann Arbor	E.	133.6	40	—	—	—	—	58.0	—
Toronto		135.7	37	—	—	—	—	e 69.2	72.4
Ottawa		136.8	31	—	—	e 39 20	?	e 58.3	—
La Paz		140.8	137	18 4	[-97]	i 21 31	?PR ₁	—	—

Additional readings: Riverview gives also $MN = +13.1m$, $MZ = +13.9m$.
Chicago eL = +53.3m. Ann Arbor LN = +58.3m. Ottawa LE = +68.3m.

Mar. 16d. Readings also at 13h. (Helwan), 14h. (La Paz and Taihoku), 16h. (La Paz), 17h. and 19h. (Taihoku).

Mar. 17d. Readings at 2h. and 4h. (La Paz), 6h. (Riverview, Wellington, and La Paz), 9h. (Helwan and La Paz), 10h. (Nagasaki), 14h. (near Florence and Padova), 20h. (La Paz and near Christchurch).

Mar. 18d. Readings at 1h. (Tacubaya), 12h. (Tacubaya and Oaxaca), 16h. and 18h. (near La Paz), 19h. (Taihoku), 23h. (near Tokyo).

Mar. 19d. 8h. 19m. 45s. Epicentre $24^{\circ}0'N$. $116^{\circ}5'E$. (as on 1919 Oct. 31d.).

$$A = -.408, B = +.817, C = +.407; \quad D = +.895, E = +.446; \\ G = -.181, H = +.364, K = -.914.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Hokoto	2.8	100	0 36	- 8	—	—	1.0	2.4
Taihoku	4.7	76	(1 24)	+11	—	—	1.4	3.9
Zi-ka-wei	8.4	30	e 2 10	+ 3	e 4 6	+19	—	—
Manila	10.3	155	e 2 35	+ 1	—	—	—	—
Kobe	19.4	52	e 2 2	?	—	—	11.7	17.6
Osaka	19.6	53	5 24	+48	8 36	+21	11.0	15.6
Mizusawa	E. 25.7	48	5 35	-10	9 57	-19	—	—
	N. 25.7	48	5 38	- 7	10 6	-10	—	—
Calcutta	E. 25.9	272	10 3	?S	(10 3)	-17	14.8	—
	N. 25.9	272	10 9	?S	(10 9)	-11	15.0	—
Batavia	31.7	199	—	—	—	e 19.5	21.2	—
Colombo	39.1	250	17 15	?L	—	—	25.2	26.2
Kodaikanal	39.7	256	12 57	?S	(12 57)	-65	23.0	25.4
Hamburg	80.0	325	—	—	—	e 42.2	45.0	—
De Bilt	83.3	325	—	—	—	e 43.2	47.3	—
Strasbourg	83.7	321	—	—	—	e 45.2	—	—
Rocca di Papa	83.8	313	e 12 39	- 2	—	e 52.0	53.4	—
Uccle	84.4	324	—	—	—	e 42.2	47.7	—
Edinburgh	85.2	330	—	—	—	—	49.2	—
Besançon	85.3	320	—	—	—	—	47.2	—
Moncalieri	85.5	318	—	—	e 39 34	?L	48.2	—
Eskdalemuir	85.6	330	—	—	—	42.2	51.8	—
Stonyhurst	86.1	329	e 42 15	?L	—	(e 42.2)	55.2	—
Paris	86.5	323	—	—	—	e 46.2	48.2	—
Kew	86.5	326	—	—	—	—	52.2	—
Oxford	86.8	326	—	—	—	—	46.8	54.4
Algiers	92.7	313	—	—	—	e 47.2	61.6	—
Rio Tinto	98.3	319	57 15	?L	—	—	(57.2)	62.2

Additional readings: Taihoku gives also $e = +15s$. Kobe MN = $+12.0m$.
Osaka MN = $+14.0m$. Batavia $e = +9m.58s$.

Mar. 19d. Readings also at 1h. and 2h. (La Paz), 11h. (Taihoku, Zi-ka-wei, and near Tokyo), 18h. (La Paz), 20h. (Rocca di Papa).

Mar. 20d. Readings at 2h. (near Rocca di Papa), 3h. and 4h. (Vera Cruz), 12h. (near Tokyo), 19h. (Pompeii and Rocca di Papa), 20h. (near Tokyo), 21h. (Helwan), 22h. (Manila, Sydney, and Riverview).

Mar. 21d. 4h. 6m. 15s. (I) { Epicentre $3^{\circ}2'N$. $82^{\circ}7'W$.
6h. 41m. 10s. (II) }

$$A = +.127, B = -.990, C = +.056; \quad D = -.992, E = -.127; \\ G = +.007, H = -.055, K = -.998.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Balboa Hts.	E. 6.5	28	3 11	?S	(3 11)	+14	3.7	4.5
I	N. 6.5	28	3 8	?S	(3 8)	+11	4.8	5.3
I La Paz	24.4	144	i 5 31	- 1	i 9 50	- 2	12.6	16.2
II	24.4	144	i 5 32	0	i 9 52	0	12.7	17.7
I Georgetown	N. 36.1	9	e 7 59	+36	(e 13 9)	- 2	e 13.2	—
I Chicago	38.8	355	8 58	?PR ₁	13 53	+ 4	e 16.8	—
II	38.8	355	8 55	?PR ₁	13 50	+ 1	16.7	—
I Ann Arbor	39.1	0	—	—	—	—	18.6	—
I Ithaca	39.6	9	e 7 52	+ 1	e 13 52	- 8	20.1	—
I Toronto	40.5	4	—	—	—	e 18.0	30.2	—
II	40.5	4	—	—	—	—	18.0	—
I Ottawa	E. 43.0	9	—	—	i 14 44	- 4	20.8	—
II	43.0	9	—	—	i 14 45	- 3	e 18.0	—

Continued on next page.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
I Victoria		57.0	330	—	—	—	—	—	33.2
I Eskdalemuir		81.4	34	—	—	23 45	+66	—	—
I Oxford		82.2	38	e 13 25	+54	—	—	42.0	54.2
I Uccle		85.6	39	e 12 55	+ 4	23 14	-12	e 39.8	—
I De Bilt	E.	86.1	38	—	—	e 23 33	+ 2	e 42.8	48.0
II		86.1	38	—	—	—	—	e 43.8	—
I Vienna	Z.	93.8	41	10 30	?	—	—	—	—
I Helwan	E.	108.9	57	20 45	?PR ₁	—	—	—	—
I Riverview		121.4	232	—	—	e 64 21	?L	e 70.6	72.5
I Kodaikanal		156.1	56	91 45	?L	—	—	(91.8)	—
I Colombo		159.8	60	—	—	—	—	—	98.8

Additional readings: Chicago (I) L = +24.8m. Ann Arbor (I) gives also
 LN = +18.2m. Ithaca (I) e = +17m.57s. Toronto (I) L = +15.2m.,
 eL = +27.0m. Ottawa (I) eLE = +18.0m., LE = +27.8m.

Mar. 21d. Readings also at 6h. (Manila), 21h. (Lick).

Mar. 22d. 11h. 54m. 27s. Epicentre 38° 8S. 146° 0W.

A = -646, B = -436, C = -627; D = -559, E = +829;
 G = +520, H = +350, K = -779.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Wellington		29.3	254	e 15 33	?L	—	—	17.0	17.6
Apia		33.8	313	—	—	12 39	+ 1	17.4	20.4
Riverview		49.9	259	e 8 59	- 7	e 16 23	+ 5	e 21.8	26.3
Sydney	E.	49.9	259	19 33	?SR ₁	24 15	?L	26.2	27.6
Melbourne		52.9	251	—	—	e 16 45?	-10	22.4	31.8
Adelaide		58.7	251	19 6	?S	(19 6)	+59	25.8	34.6
Victoria		89.5	15	—	—	—	—	—	57.0
Manila		101.5	280	—	—	e 24 33	-97	—	—
Toronto		102.0	41	—	—	—	—	73.6	85.2
De Bilt		156.0	47	—	—	—	—	e 101.6	—
Uccle		156.0	50	—	—	—	—	e 95.6	—
Helwan		170.8	165	44 33	?SR ₁	—	—	—	—

Additional readings: Apia gives also MN = +32.2m. Riverview MN =
 -26.0m.; it is difficult to account for the discrepancy between the readings
 given at Riverview and Sydney for this earthquake. Adelaide S =
 +23m.18s. De Bilt eLN = +99.6m.

Mar. 22d. Readings also at 13h. and 23h. (La Paz).

FIRST SOLUTION (See Note at end).

Mar. 23d. 22h. 44m. 6s. Epicentre 8° 0S. 127° 5E. (as on 1920 Mar. 3d.).

A = -603, B = +786, C = -139; D = +793, E = +609;
 G = +085, H = -110, K = -990.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Batavia		20.6	274	e 5 13	+25	e 9 37	+61	e 16.9	11.0
Manila		23.5	344	e 5 26	+ 3	(9 28)	- 7	9.5	9.6
Adelaide		28.8	161	e 6 18	+ 2	e 11 18	+ 5	16.0	47.0
Taihoku		33.5	350	—	—	e 10 34	-118	—	—
Melbourne		33.7	156	e 6 0	-62	e 12 12	-24	17.6	20.1
Riverview		33.8	142	e 7 10	+ 7	e 14 10	+92	e 17.6	19.6
Sydney	E.	33.9	142	8 12	+68	12 36	- 3	18.4	19.1
Mizusawa	E.	48.8	15	8 46	-13	15 12	-52	—	—
	N.	48.8	15	9 2	+ 3	15 17	-47	—	—
Calcutta	E.	49.0	310	9 30	+30	(18 18)	+132	18.3	—
	N.	49.0	310	9 42	+42	(17 54)	+108	17.9	—

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Colombo	49.8	286	10 54	+108	20 54	?	29.4	36.9
Kodaikanal	53.1	290	12 54	?PR ₁	—	—	29.9	36.0
Wellington	53.4	137	e 3 24	?	—	—	—	32.4
Helwan	99.4	300	18 54	?PR ₁	—	—	—	—
Victoria	108.9	41	—	—	—	—	40.7?	55.9
De Bilt	115.8	322	—	—	e 35 54	?SR ₁	e 55.9	61.5
Moncalieri	116.6	316	—	—	—	—	e 59.9	—
Uccle	116.7	321	—	—	e 27 54	-30	e 53.9	60.9
Stonyhurst	119.2	325	e 17 54	+135	—	—	—	78.9
Tortosa	122.8	313	—	—	—	—	e 59.9	65.1
Chicago	134.2	37	—	—	(e 39 41)	?SR ₁	77.9	—
La Paz	151.0	148	20 13	[+16]	34 34	?	76.4	85.6

Additional readings: Manila gives MN = +9.8m. Adelaide iS = +12m.12s.,
 SR₁ = +14m.24s., SR₂ = +15m.0s., SR₃ = +15m.18s. Riverview MN =
 +18.7m., MZ = +23.6m. De Bilt MN = +77.1m. Epicentre 7° 1S.
 128° 8E. Chicago SR₁ is given as eL.

NOTE: This solution was the best that could be attained, after some work, from the consideration of the above material alone. But the following shock for which an independent solution gives another epicentre, has much in common with this, as direct comparison shows. On combining the two the mean residuals suggested that the epicentre should be nearer Australia, and also nearer Manila in an approximately opposite azimuth (which indicates deep focus); further that it should be more to the East. Now there is an epicentre 5° 5S. 130° 0E., for which on 1920 May 10 the observations suggested a deep focus, viz. 0.060. This depth seems rather large for the present observations, but it was decided to give, as alternative, a solution with the same epicentre and depth of focus as below.

SECOND SOLUTION.

Mar. 23d. 22h. 44m. 50s. Epicentre 5° 5S. 130° 0E. (as on 1920 May 10d.).

A = -640, B = +763, C = -096.

Depth of focus 0.060.

	Corr. for Focus	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	-2.7	22.0	336	e 4 42	-9	8 44	+36	8.8	8.9
Batavia	-2.8	23.0	267	e 4 29	-14	e 8 53	+26	e 16.2	10.3
Adelaide	-3.8	30.5	166	e 5 34	-21	e 10 34	-1	15.2	46.3
Taihoku	-4.0	31.6	347	—	—	e 9 50	-62	—	—
Riverview	-4.2	34.5	148	e 6 26	-5	e 13 26	?SR ₁	e 16.9	18.9
Sydney	-4.2	34.5	148	7 28	?PR ₁	11 52	+13	17.7	18.4
Melbourne	-4.2	35.1	160	e 5 16	-81	e 11 28	-22	16.9	19.4
Mizusawa	E. -5.2	45.8	13	8 2	+2	14 28	+13	—	—
	N. -5.2	45.8	13	8 18	+18	14 33	+18	—	—
Calcutta	E. -5.5	49.5	308	8 46	+20	—	—	17.6	—
	N. -5.5	49.5	308	8 58	+32	—	—	17.2	—
Colombo	-5.6	51.6	282	10 10	?PR ₁	20 10	?	28.7	36.2
Kodaikanal	-5.9	54.7	286	12 10	?	—	—	29.2	35.3
Helwan	-7.8	100.2	300	18 10	?PR ₁	—	—	—	—
Victoria	—	105.1	41	—	—	—	—	40.0?	55.2
De Bilt	—	115.1	325	—	—	e 35 10	?	e 55.2	60.7
Uccle	—	116.1	324	—	—	e 27 10	?	e 53.2	60.2
Moncalieri	—	116.3	319	—	—	—	—	e 59.2	—
Stonyhurst	—	118.3	330	e 17 10	[-98]	—	—	—	78.2
Tortosa	—	122.8	316	—	—	—	—	e 59.2	64.3
Chicago	—	130.7	37	—	—	(e 38 57)	?SR ₁	77.2	—
La Paz	—	151.6	141	19 29	[-29]	33 50	?	75.7	84.9

Additional readings: Manila gives MN = +9.0m. Adelaide iS = +11m.28s.
 (?SR₁), SR₁ = +13m.40s., SR₂ = +14m.16s., SR₃ = +14m.34s. Riverview
 MN = +18.0m., MZ = +22.8m. De Bilt MN = +76.4m. Epicentre
 7° 1S. 128° 8E. Chicago gives eL which is taken above as SR₁.

Mar. 23d. Readings also at 1h. (La Paz), 2h. (Helwan and near Batavia), 11h. (La Paz), 12h. (Helwan), 13h. (Riverview and Melbourne), 15h. (Helwan), 20h. (San Fernando), 23h. (La Paz).

FIRST SOLUTION (See Note at end).

Mar. 24d. 1h. 25m. 12s. Epicentre 6°·5S. 131°·5E.

A = -·658, B = +·744, C = -·113; D = +·749, E = +·663;
G = +·075, H = -·085, K = -·994.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		m.	s.	m.	s.	m.	s.	m.	m.
Manila		23·5	334	e 5 33	+10	(9 39)	+ 4	9·6	9·8
Batavia		24·5	269	e 5 32	- 1	i 9 52	- 2	e 15·8	—
Adelaide		29·2	168	—	—	i 12 24	+64	16·2	17·4
Sydney	E.	32·9	149	8 18	?PR ₁	12 54	+32	18·8	20·3
Riverview		32·9	149	e 7 5	+ 9	e 14 5	?SR ₁	e 17·9	25·4
Taihoku		33·0	345	—	—	e 12 3	-21	—	—
Melbourne		33·6	160	—	—	e 11 54	-40	17·8	20·2
Osaka		41·3	5	8 18	+13	(14 33)	+ 8	14·6	16·6
Nagano		43·6	7	i 8 27	+ 4	i 15 6	+10	—	—
Wellington		51·8	139	—	—	e 17 48	+67	e 21·5	32·8
Colombo		53·2	284	16 48	?S	(16 48)	-11	30·8	37·8
Kodaikanal		56·4	289	25 36	?L	—	—	29·9	32·8
Victoria		104·9	40	—	—	—	—	—	57·7
Uccle		117·8	325	—	—	—	—	e 59·8	—
De Bilt		116·8	326	—	—	—	—	e 56·8	61·6
Moncalieri		118·1	318	—	—	—	—	e 69·1	—
Stonyhurst		119·8	330	—	—	—	—	—	68·8
Chicago		130·6	37	—	—	—	—	e 65·8	—
La Paz		149·8	140	i 20 40	[+44]	—	—	77·3	—

Additional readings: Manila gives MN = -9·9m. Adelaide SR₁ = -14m.36s.
SR₂ = +15m.24s., SR₃ = +15m.39s. Riverview MN = +22·6m., MZ =
+22·1m. Melbourne PR₁ = +7m.36s., SR₁ = +14m.42s. De Bilt
MN = +75·5m. Epicentre 6°·9S. 130°·5E.

NOTE: The above solution represents the best that could be done from the study of the above material alone. But as already stated in the note to the previous earthquake, direct comparison suggested that the two might be from the same focus; and on combining them, further discussion suggested similarity with the conditions of 1920 May 10: viz., a focus 0·060 radius below normal, and a position 5°·5S. 130°·0E. for the epicentre. The following solution is therefore given with these elements, though the depth 0·060 is perhaps excessive for the present shock:—

SECOND SOLUTION.

Mar. 24d. 1h. 26m. 0s. Epicentre 5°·5S. 130°·0E. (as on Mar. 23d.).

A = -·640, B = +·763, C = -·096.

A focal depth 0·060 below normal is assumed as on 1920 May 10.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		m.	s.	m.	s.	m.	s.	m.	m.
Manila	-2·7	22·0	336	e 4 45	+12	—	—	8·8	9·0
Batavia	-2·8	23·0	267	e 4 44	+ 1	i 9 4	+37	e 15·0	—
Adelaide	-3·8	30·5	166	—	—	i 11 36	+61	15·4	16·6
Taihoku	-4·0	31·6	347	—	—	e 11 15	+23	—	—
Riverview	-4·2	34·5	148	e 6 17	-14	e 13 17	?SR ₁	e 17·1	24·6
Sydney	-4·2	34·5	148	7 30	?PR ₁	12 6	+27	18·0	19·5
Melbourne	-4·2	35·1	160	—	—	e 11 6	-44	17·0	19·4
Osaka	-4·7	40·4	7	7 30	+11	(13 45)	+39	13·8	15·8
Nagano	-4·9	42·9	10	17 39	+ 1	i 14 18	+40	—	—
Colombo	-5·6	51·6	282	16 0	?S	16 0	+32	30·0	37·0
Kodaikanal	-5·9	54·7	286	24 48	?L	—	—	29·1	32·0
Victoria	—	105·1	41	—	—	—	—	—	56·9
De Bilt	—	115·1	325	—	—	—	—	e 56·0	60·8
Uccle	—	116·1	324	—	—	—	—	e 59·0	—
Moncalieri	—	116·3	319	—	—	—	—	e 63·3	—
Stonyhurst	—	118·3	330	—	—	—	—	—	68·0
Chicago	—	130·7	37	—	—	—	—	e 65·0	—
La Paz	—	151·6	141	i 19 52	[- 6]	—	—	76·5	—

Additional readings: Manila gives MN = -9·1m. Adelaide SR₁ = +13m.48s.
SR₂ = +14m.36s., SR₃ = +14m.51s. Riverview MN = +21·8m., MZ =
+21·3m. Melbourne PR₁ = +6m.48s., SR₁ = +13m.54s. De Bilt
MN = +74·7m. Epicentre 6°·9S. 130°·5E.

Mar. 24d. 9h. 17m. 7s. Epicentre $30^{\circ}2\text{S}$. $177^{\circ}7\text{W}$. (as on 1921 Jan. 7d.).

A = $-.864$, B = $-.035$, C = $-.503$; D = $-.040$, E = $+.999$;
G = $+.503$, H = $+.020$, K = $-.864$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Wellington	12.7	206	e 3 41	+32	—	—	i 6.6	7.9
Apia	17.2	20	4 5	-2	—	—	8.4	9.1
Sydney	26.6	254	5 41	-13	9 11	-82	13.1	15.2
Riverview	26.6	254	e 5 50	-4	e 10 50	+17	e 13.1	15.6
Melbourne	31.7	246	e 6 5	-39	e 11 5	-58	14.5	21.3
Adelaide	36.9	256	e 8 53	+84	e 13 11	-11	20.1	24.1
Manila	74.1	298	e 11 53	+10	—	—	—	—
Batavia	74.3	272	e 12 4	+20	—	—	e 42.3	54.1
Taihoku	80.3	307	—	—	—	—	e 38.7	—
Berkeley	85.4	41	—	—	—	—	e 41.9	—
Victoria	92.4	33	—	—	—	—	—	48.7
La Paz	97.7	114	e 13 46	-12	i 24 19	-74	51.3	52.9
Colombo	104.3	270	32 53	?SR ₁	57 53	?L	65.9	77.9
Kodaikanal	107.9	272	57 59	?L	—	—	63.6	68.3
Chicago	109.6	53	—	—	e 24 53	-151	56.2	—
Ann Arbor	E. 112.5	51	—	—	(28 11)	+21	69.0	—
N. 112.5	51	—	—	—	(28 5)	+15	68.9	—
Toronto	115.9	53	—	—	—	—	e 65.4	67.7
Georgetown	116.1	58	—	—	—	—	69.1	—
Ithaca	117.5	54	—	—	—	—	e 65.7	—
Ottawa	118.9	52	—	—	e 25 43	-178	e 66.4	—
Helwan	154.9	275	22 53	?PR ₁	—	—	—	—
Stonyhurst	156.0	7	e 64 23	?L	—	—	(e 64.4)	98.9
De Bilt	158.0	353	—	—	e 44 53	?SR ₁	e 88.9	89.8
Kew	158.6	5	—	—	—	—	—	106.9
Uccle	159.3	355	—	—	e 36 53	?	e 83.9	—
Moncalieri	164.6	345	—	—	—	—	e 94.0	—
Rocca di Papa	165.7	327	—	—	i 28 14	?	e 93.4	—
Tortosa	169.3	5	—	—	—	—	e 88.9	101.1
Rio Tinto	169.4	42	90 53	?L	—	—	(90.9)	109.9
San Fernando	170.5	46	—	—	—	—	91.7	100.9

Additional readings and notes: Riverview gives also $PR_1 = +6m.49s.$, $MZ = +15.3m.$, $MN = +16.2m.$. Melbourne $PR_1 = +7m.17s.$. Adelaide readings are all given as "e" simply. Also $e = +17m.29s.$. La Paz $iPV = +13m.53s.$, $SN = +26m.18s.$, $LE = +52.1m.$, $T_0 = 9h.15m.32s.$. Ann Arbor readings are all given as L. Toronto $e? = +50m.35s.$, $e = +60m.41s.$, $eL = +72.5m.$ and $+75.3m.$. Ottawa $eE = +30m.3s.$ and $+52m.49s.$, $eL = +36.3m.$. Stonyhurst P has been increased by 1h. De Bilt $MN = +115.6m.$. Uccle $e = +52m.29s.$. Rocca di Papa $eN = +28m.41s.$. San Fernando $MN = +99.4m.$

1921. Mar. 24d. 14h. 41m. 40s. Epicentre $50^{\circ}5\text{N}$. $159^{\circ}0\text{E}$.

A = $-.594$, B = $+.228$, C = $+.772$; D = $+.358$, E = $+.934$;
G = $-.720$, H = $+.276$, K = $-.636$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ootomari	11.4	257	2 43	-7	(4 58)	-6	5.0	6.6
Hakodate	15.3	242	e 4 2	+19	—	—	—	4.6
Mizusawa	E. 17.0	235	4 14	+9	7 24	+6	—	—
N. 17.0	235	4 13	+8	7 22	+4	—	—	—
Mito	19.4	230	4 44	+10	(8 17)	+7	8.3	—
Tokyo	20.3	230	5 20?	+35	7 27	-62	9.4	9.9
Osaka	23.3	236	5 21	+1	(9 35)	+4	9.6	11.9
Kobe	23.4	237	5 20	-1	(9 33)	0	9.8	10.5
Nagasaki	27.8	242	e 6 5	-1	(10 40)	-15	10.7	—
Zi-ka-wei	33.8	252	e 6 56	-7	e 12 14	-24	e 16.1	19.1
Taihoku	38.8	243	—	—	e 13 23	-26	—	—
Honolulu	E. 44.4	113	—	—	i 18 56	?SR ₁	21.3	25.0
N. 44.4	113	—	—	—	i 15 12	+5	21.2	24.8
Manila	47.2	235	e 8 49	+1	—	—	—	—
Victoria	48.2	60	(9 26)	+31	(15 49)	-7	15.8	21.7
Berkeley	55.1	70	—	—	e 17 20	-2	—	—
Lick	55.9	70	—	—	—	—	e 23.3	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta	E.	60.7	273	10 14	- 3	(18 32)	0	18.5	—
	N.	60.7	273	10 20	+ 3	(18 38)	+ 6	18.6	—
Konigsberg	E.	69.1	337	17 59	?	19 13	-62	33.5	—
	N.	69.1	337	18 3	?	—	—	31.5	—
Chicago		71.0	46	12 20	+57	20 40	+ 2	32.3	—
Dyce	N.	71.2	349	—	—	i 21 20	-40	36.3	—
St. Louis	E.	72.2	49	e 11 44	+13	20 56	+ 4	35.3	—
Batavia		72.2	237	e 11 34	+ 3	—	—	e 36.6	—
Ann Arbor	E.	72.3	42	—	—	21 8	+14	37.4	—
	N.	72.3	42	—	—	21 20	+26	37.9	—
Lemberg		72.5	332	e 12 20	+47	—	—	e 35.8	46.4
Edinburgh		72.6	349	—	—	—	—	31.3	44.8
Hamburg		72.8	343	e 11 34	- 1	—	—	e 34.3	41.8
Toronto		73.0	40	—	—	21 2	0	35.9	45.2
Ottawa		73.1	36	11 41	- 4	21 3	0	e 35.3	—
De Bilt	E.	75.0	344	—	—	—	—	e 33.3	45.7
	N.	75.0	344	11 42	- 7	21 24	- 2	e 36.3	51.8
Ithaca		75.3	38	e 11 44	- 7	e 21 22	- 7	e 38.3	—
Budapest		76.1	335	e 11 22	-34	e 23 30	+112	—	46.3
Vienna		76.2	337	i 11 50	- 6	—	—	38.3	44.4
Uccle		76.4	345	11 56	- 1	21 36	- 6	34.3	47.6
Oxford		76.4	348	—	—	i 21 59	+17	32.0	48.4
Kew		76.5	348	31 20	?L	—	—	(31.3)	53.3
Kodaikanal		76.8	273	23 2	?S	(23 2)	+75	46.6	63.1
Harvard	E.	77.4	35	—	—	e 20 49	-64	e 38.5	43.9
Colombo		77.8	269	23 20?	?S	(23 20?)	+82	51.3	54.3
Strasbourg		77.9	341	12 7	+ 1	e 17 36	?PR ₁	22.3	45.4
Washington		78.0	40	11 9	-58	21 4	-56	36.9	—
Georgetown	E.	78.0	40	12 9	+ 2	22 2	+ 2	38.5	—
	N.	78.0	40	12 10	+ 3	22 2	+ 2	40.8	—
Paris		78.7	346	i 12 11	0	i 23 7	- 1	42.3	46.3
Zurich		78.9	340	e 12 14	+ 2	—	—	e 43.3	—
Pola		79.6	338	e 21 41	?S	(e 21 41)	-38	e 35.8	51.2
Besançon		79.6	343	12 15	- 2	17 11?	?PR ₁	43.3	—
Padova		80.0	339	12 40	+21	23 0	+37	—	55.1
Moncalieri		81.4	341	12 34	- 7	19 24	?PR ₁	28.0	53.0
Florence		81.6	337	8 20?	?	—	—	—	30.8
Rocca di Papa		83.2	337	e 12 35	- 2	22 51	- 8	e 44.8	56.6
Athens	E.	83.3	326	e 12 32	- 6	—	—	e 42.0	48.6
	N.	83.3	326	e 12 29	- 9	22 40	-20	—	48.2
Marseilles		83.4	342	e 12 37	- 1	e 17 23	?PR ₁	22.3	46.7
Pompeii		83.6	334	12 20	-20	22 20	-45	46.3	54.3
Riverview		84.7	187	e 12 25	-21	e 23 5	-11	e 40.1	41.8
Barcelona	E.	85.9	344	13 8	+15	23 21	- 8	38.8	53.6
	N.	85.9	344	—	—	—	—	28.9	52.7
Tortosa		86.8	346	12 48	-10	23 11	-28	36.9	57.8
Helwan	E.	87.3	318	13 38	+37	—	—	—	60.3
Coimbra	E.	88.7	351	12 54	-15	23 38	-22	e 37.5	55.1
	N.	88.7	351	e 12 44	-25	—	—	e 37.7	59.2
Melbourne		89.2	192	e 13 26	+15	e 23 38	-27	e 40.6	59.3
Algiers		90.2	341	e 12 53	-24	23 33	-43	37.3	50.8
Rio Tinto		90.8	349	27 20	?S	(27 20)	+178	—	68.3
Granada		91.0	347	i 13 29	+ 8	43 43	?L	(43.7)	—
San Fernando		92.1	349	—	—	23 2	-94	—	58.5
La Paz		129.3	66	i 19 27	[+10]	33 35	?	63.8	68.4

Additional readings and notes : Ootomari gives also MN = +5.8m. Tokyo MN = +10.8m. Osaka MN = +10.4m. Kobe S is given as LN, also MN = +9.7m. Batavia e = +14m.43s., i = +20m.42s. Konigsberg PNE = 14h.21m.25s., PZ = +17m.9s., eLEN = +21.0m., LZ = +43.5m. Chicago L = +34.8m. St. Louis L = +39.3m. Dyce LE = +32.3m. Hamburg MZ = +42.2m., MN = +48.6m. Toronto S = +23m.8s.?, eL = +39.5m., eL = +46.4m., iL = +44.2m. Ottawa PR₂NE = +16m.36s., SR₁E = +26m.28s., L = +39.3m., +49.3m., and +52.3m., T₀ = 14h.41m.58s. Eskdalemuir (Δ = 73.2) gives just 15h. to 17h. De Bilt eE = +21m.44s., eSR₁ = +26m.15s. Ithaca e = +29m.56s. Budapest e = +13m.32s. Vienna eLE = +34.6m., eLNZ = +38.6m., MNZ = +48.4m. Uccle SR₁ = +27m.4s., MN = +50.4m. Harvard iE = +21m.53s. and +26m.59s., iLE = +42.4m., T₀ = 14h.44m.57s. Colombo P = +35m.20s., S = +47m.20s. Strasbourg MN = +48.2m., MZ = +52.0m. Georgetown eLE = +35.7m. Pola MN = +51.4m. Padova PR₁ = +16m.48s., Moncalieri MN = +55.9m. Rocca di Papa i = +12m.41s., L = +37.8m. Riverview eS = +23m.29s., SR₂ = +29m.23s., e = +35m.25s. Coimbra LN = +43.3m., LE = +50.7m. Melbourne SR₁ = +29m.26s. Granada gives its readings as on 25d. San Fernando MN = +59.3m. La Paz LN = +66.3m., T₀ = 14h.42m.8s.

Mar. 24d. Readings also at 0h. (Zi-ka-wei), 2h. (La Paz and Manila), 3h. (Tortosa, La Paz, and Riverview), 5h. (La Paz and Harvard), 6h., 10h., and 11h. (La Paz), 17h. (Nagasaki and Wellington), 18h. (near Sapporo), 19h. (Manila), 22h. (La Paz), 23h. (Fordham and La Paz).

Mar. 25d. 0h. 32m. 50s. Epicentre $33^{\circ}6'N$, $111^{\circ}4'W$.

A = -304, B = -776, C = +553; D = -931, E = +365;
G = -202, H = -515, K = -833.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tucson	E.	1.4	161	e 0 25	+ 4	—	—	e 1.0	e 1.8
	N.	1.4	161	—	—	e 0 38	- 1	e 1.1	e 1.5
Denver		8.0	38	(2 10)	+9	—	—	2.2	4.2
Lick		9.2	297	—	—	e 3 19	-49	—	—
Berkeley		9.8	298	—	—	—	—	e 4.2	9.4
Victoria		17.3	333	7 25	?S	(7 25)	0	9.4	12.8
St. Louis		17.8	68	—	—	—	—	i 10.8	13.6
Tacubaya	E.	17.8	140	3 50	-25	7 44	+ 8	9.3?	10.7
Vera Cruz	E.	19.8	133	4 45	+ 6	—	—	11.3	11.5
Chicago		20.4	59	—	—	e 9 6	+34	i 11.2	—
Ann Arbor		23.4	60	—	—	—	—	16.7	—
Toronto		26.7	58	—	—	—	—	13.3	19.5
Georgetown		28.0	69	—	—	—	—	e 15.8	—
Washington		28.0	69	—	—	—	—	e 14.6	—
Cheltenham		28.2	69	i 16 3	?L	—	—	e 16.7	16.5
Ithaca		28.7	62	—	—	e 11 10	- 2	e 16.0	—
Ottawa		29.6	56	—	—	e 11 26	- 1	e 17.2	—
Northfield		31.6	58	—	—	—	—	e 17.8	—
Harvard	E.	32.6	60	e 18 28	?L	i 18 40	?	32.2	—
	N.	32.6	60	e 18 11	?L	i 18 35	?	e 31.9	—
Coimbra		77.7	49	24 57	?SR ₁	30 56	?	e 38.7	—
De Bilt		78.0	33	—	—	—	—	e 38.2	48.8
Uccle		78.5	35	—	—	—	—	e 37.2	—
Paris		78.8	39	—	—	—	—	44.2	—
Rio Tinto		80.2	50	43 10	?L	—	—	(43.2)	57.2
Tortosa		82.8	44	—	—	—	—	e 38.2	43.9
Helwan		107.4	32	55 10	?L	—	—	(55.2)	—

Additional readings: Denver gives also MN = +2.7m. Lick eE = +3m.35s.
Berkeley eN = +4m.6s., eV = +4m.12s. Victoria MV = +12.2m.
St. Louis ePE = 0h.30m.30s., MN = +11.2m. Vera Cruz readings increased
by 19m. Toronto eL = +16.5m. Georgetown eLEN = +17.6m.
Cheltenham MN = +16.8m. Ithaca e = +14m.10s. Ottawa i =
+16m.48s., L = +20.9m. Harvard LN = +34.8m., LE = +35.1m., T.
= 0h.31m.26s. De Bilt MN = +42.3m.

Mar. 25d. Readings also at 3h. (2) and 4h. (near Tacubaya), 20h. (Taihoku), 22h. (Chicago, Georgetown, and Ottawa), 23h. (near Tokyo).

Mar. 26d. Readings at 0h. (Melbourne, Riverview, and near Nagasaki), 1h. (Apia), 2h. (Riverview, Melbourne, and Kodaikanal), 3h. (Helwan), 13h. (Riverview and Melbourne), 14h. (Helwan), 22h. (La Paz and near Porto Rico and Port au Prince).

Mar. 27d. Readings at 12h. (La Paz), 21h. (near Tokyo).

1921. Mar. 28d. 7h. 49m. 20s. Epicentre 14° 5N. 86° 0W.

(as on 1919 June 29d.).

A = +.068, B = -.966, C = +.250; D = -.998, E = -.070;
G = +.017, H = -.250, K = -.968.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	E.	8.3	130	2 20	+14	4 2	+17	5.5	6.8
	N.	8.3	130	2 14	+8	3 54	+9	5.4	5.5
Oaxaca	E.	10.7	285	2 48	+8	(4 42)	-6	4.7	5.2
Vera Cruz	E.	10.8	297	3 3	+22	—	—	6.0	8.6
Puebla	N.	12.6	293	4 23	+76	—	—	7.2	7.5
Tacubaya	N.	13.6	293	3 14	-7	6 2	+4	6.8	6.9
Porto Rico	E.	20.0	77	i 4 55	+14	i 8 57	+34	e 10.7	13.2
	N.	20.0	77	4 55	+14	—	—	e 11.4	16.2
Mazatlan	E.	21.2	298	4 53	-2	9 8	+20	11.9	12.9
St. Louis	E.	24.4	352	i 5 37	+5	10 4	+12	14.1	11.1
	N.	24.4	352	—	—	10 10	+18	—	15.3
Cheltenham	E.	25.6	17	i 5 45	+1	i 10 35	+21	13.8	17.2
	N.	25.6	17	e 5 28	-16	i 10 29	+15	13.3	16.2
Georgetown	E.	25.7	16	i 5 50	+5	i 11 36	+80	—	12.9
	N.	25.7	16	i 5 50	+5	i 11 35	+79	—	11.6
Washington		25.7	16	4 50	-55	9 36	?	14.2	—
Chicago		27.3	357	5 59	-2	11 47	+61	—	—
Ann Arbor	E.	27.9	4	6 10	+3	11 10	+13	13.4	14.3
Fordham	E.	28.4	20	6 16	+4	11 22	+16	—	19.5
Tucson	E.	28.8	312	e 6 8	-8	10 50	-23	e 16.8	18.9
	N.	28.8	312	—	—	e 10 46	-27	e 15.8	16.7
Ithaca		29.1	14	6 7	-12	i 11 15	-4	e 14.6	—
Toronto		29.7	10	6 22	-3	11 58	+29	16.5	18.8
Harvard	E.	30.7	21	i 6 37	+2	i 11 52	+6	16.0	18.5
	N.	30.7	21	6 35	0	i 11 51	+5	15.9	18.8
Northfield		31.8	20	e 7 26	+41	12 40	+35	16.7	—
Ottawa		32.1	12	6 45	-3	12 9	-1	e 17.2	—
La Paz		35.6	151	6 50	-28	i 12 21	-43	16.2	21.0
Lick		39.0	315	e 7 38	-8	e 13 33	-19	—	—
Berkeley	E.	39.7	315	e 7 39	-13	e 13 41	-21	e 18.8	24.8
	N.	39.7	315	e 7 43	-9	e 13 44	-18	e 19.3	—
Saskatoon		40.7	344	e 8 26	+25	i 14 49	+32	e 22.1	—
Victoria		45.7	326	8 12	-26	14 35	-49	22.4	32.3
	Z.	45.7	326	8 26	-12	15 24	0	25.4	29.4
Azores		57.8	54	—	—	—	—	—	44.9
Honolulu	E.	68.4	288	i 11 1	-6	i 19 56	-11	31.6	32.0
	N.	68.4	288	11 13	+6	i 20 2	-5	—	20.3
Coimbra		71.3	51	i 11 34	+9	i 20 57	+15	31.1	36.8
Rio Tinto		72.9	55	31 40	?L	—	—	(31.7)	42.7
San Fernando		73.3	56	11 11	-27	20 22	-44	37.9	44.9
Edinburgh		74.0	35	11 50	+8	i 21 23	+9	35.7	38.5
Stonyhurst		74.6	38	i 11 46	0	21 22	+1	36.2?	47.9
Dyce	E.	74.6	33	—	—	21 28	+7	30.5	36.7
	N.	74.6	33	—	—	21 28	+7	33.6	35.9
Granada		75.3	54	i 12 3	+12	i 21 48	+19	—	—
Oxford		75.4	41	11 54	+3	21 43	+13	35.1	41.2
Kew		76.1	40	11 40	-16	—	—	—	60.7
Tortosa		78.0	50	12 11	+4	22 10	+10	e 35.7	—
Paris		78.2	42	i 12 10	+2	i 22 9	+7	36.7	38.7
Uccle		79.0	40	i 12 15	+2	i 22 18	+6	33.7	43.1
Barcelona		79.1	50	12 13	-1	i 22 19	+6	33.8	39.4
De Bilt		79.3	39	12 19	+4	12 22	+7	e 38.7	39.7
Algiers		80.7	54	12 25	+2	22 37	+6	38.7	40.7
Besançon		80.8	44	12 25	+1	22 38	+5	38.7	—
Marseilles		81.2	48	e 12 45	+19	22 45	+8	e 36.7	44.4
Strasbourg		81.6	42	12 30	+2	22 44	+2	e 36.7	45.4
Hamburg		81.9	37	e 12 28	-2	e 22 38	-7	e 37.7	42.4
Moncalieri		82.4	45	12 23	-9	i 22 52	+2	30.2	44.7
Zurich		82.5	44	e 12 33	0	22 51	-1	—	—
Milan		83.2	43	13 55	?	—	—	40.7	—
Florence		85.1	45	11 58	-51	23 17	-3	33.9	42.5
		85.1	45	12 50	+1	23 20	0	29.7	43.7
Padova		85.1	43	13 4	+15	23 24	+4	—	45.7
Pola		86.6	45	e 12 53	-4	e 23 14	-23	e 40.2	46.7
Rocca di Papa		86.7	47	13 19	+22	i 23 19	-19	—	43.0
		86.7	47	i 13 19	+22	i 23 13	-25	e 41.3	—
Vienna		87.2	40	12 46	-14	i 23 18	-25	e 42.1	48.8
Pompeii	E.	88.3	48	12 55	-12	22 55	-60	34.7	45.7

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	89.5	258	12 53	-20	23 28	-41	40.9	—
Lemberg	91.3	38	12 58	-25	i 23 43	-44	e 41.9	49.9
Athens	E. 95.9	48	e 13 58	+10	i 24 2	-73	e 46.5	53.0
	N. 95.9	48	e 14 16	+28	—	—	—	54.4
Ootomari	E. 104.9	327	24 56	? 8	(24 56)	-105	59.6	62.6
Helwan	E. 105.1	53	14 40	-5	19 4	?PR ₁	—	62.2
	N. 105.1	53	16 34	?	—	—	—	62.6
Wellington	E. 106.4	230	e 14 16	-25	i 24 40	-136	e 48.0	50.7
Sydney	E. 125.1	239	20 22	?PR ₁	(26 4)	-203	57.4	62.9
Riverview	E. 125.1	239	e 17 1	+55	e 30 29	+62	e 54.9	58.8
Zi-ka-wei	E. 127.3	330	e 22 22	?PR ₁	—	—	—	80.1
Melbourne	E. 129.4	232	e 19 22	[+5]	e 31 40	?	e 57.9	66.6
Simla	E. 131.6	20	e 22 22	?PR ₁	—	—	65.4	71.4
Taihoku	E. 132.3	325	—	—	e 33 34	?	—	83.4
Adelaide	E. 135.1	235	e 21 40	?PR ₁	—	—	62.4	78.2
Manila	E. 140.6	316	e 19 40	[0]	—	—	64.4	—
Bombay	E. 140.6	32	80 45	?L	—	—	(80.8)	—
Calcutta	E. 142.6	8	19 46	[+2]	—	—	—	—
Mauritius	E. 145.1	105	—	—	—	—	—	75.7
Kodaikanal	E. 150.3	34	22 58	?PR ₁	(38 52)	?	83.8	122.9
Colombo	E. 154.4	34	23 10	?PR ₁	44 40?	?SR ₁	90.7?	114.7
Batavia	E. 164.9	302	e 20 21	[+9]	—	—	80.0	99.0

Additional readings and notes : Oaxaca gives its readings as at 6h. Puebla readings are given on 27d. and diminished by 5m. Porto Rico gives also PR₁N = +5m.32s., SR₁N = +9m.57s. Vera Cruz readings diminished by 39m. Cheltenham iE = +5m.45s. Georgetown iEN = +6m.40s. Ann Arbor (Wiechert) LE = -13.9m., LN = -13.5m., ME = -14.2m. Tucson e = +7m.8s., iE = +12m.5s. Toronto eP = +7m.58s., i = +10m.40s. and +14m.16s., eL = +73.1m. Harvard iN = +7m.51s., iE = +7m.54s. and +9m.29s., LNE = +15.7m., iNE = +15m.47s., T₀ = 7h.49m.15s. Ottawa SR₂? = +14m.17s., T₀ = 7h.49m.17s. La Paz iPN = +6m.52s., MN = +21.8m., L (rep.) = 10h.36m.0s., T₀ = 7h.49m.12s. Lick ePN = +7m.36s., T₀ = 7h.49m.25s. Berkeley e?E = +17m.6s., e?N = +17m.11s. Saskatoon i = +10m.17s., iE = +18m.12s., iN = +18m.17s., eN = +20m.21s. Honolulu SR₂N = +27m.51s. Coimbra MN = +35.5m., T₀ = 7h.49m.30s. Edinburgh PR₁ = +15m.3s., SR₁ = +30m.28s. Oxford PR₁ = +14m.51s. Paris MN = +40.7m. Uccle PR₁ = +15m.56s., SR₁ = +27m.5s. Barcelona SN = +22m.52s., PS = +23m.26s., SR₁ = +28m.24s., MN = +38.5m. De Bilt MN = +39.3m. Strasbourg PR₁ = +15m.59s., MZ = +45.3m., MN = +45.5m. Hamburg PS = +23m.46s., MZ = +40.7m., MN = +47.8m. Moncalieri MN = +44.6m. Padova PR₁ = +17m.0s., SR₁ = +23m.42s. Pola MN = +45.5m. Rocca di Papa eP = +11m.19s. Vienna PZ = +12m.56s., iE = +15m.41s., PR₂Z? = +16m.36s., iZ = +16m.55s., iE = +17m.1s., and +24m.47s. Apia PR₁ = +17m.28s., SR₁ = +31m.40s. Athens PR₁E = +17m.16s., SR₁ = +26m.34s., T₀ = 7h.51m.12s. Ootomari gives L and M as for a separate shock, for which P = +53m.58s. Wellington ePR₁ = +18m.22s. Sydney gives L and M as for a separate shock for which S = +49m.40s. Riverview PS = +31m.17s., eSR₁ = +37m.48s. and +38m.33s., MN = +57.9m., MZ = +58.5m., L (rep.) = +112.0m., readings all given as on 29d. Zi-ka-wei MN = +77.8m. Melbourne PR₂ = +26m.40s., eSR₁ = +38m.22s., iSR₁ = +39m.28s. Simla MN = +70.6m. All these readings are given one hour too late. Adelaide iP = +22m.40s., e = +28m.34s., +32m.16s., +39m.58s., +44m.40s., and +47m.28s. Calcutta PN = -19m.52s. Mauritius MN = +72.7m. Colombo L = +112.7m. Batavia i = +25m.6s. and +31m.21s., L = +54.4m.

Mar. 28d. Readings also at 1h. (La Paz), 6h. (Christchurch), 9h. (Sydney), 12h. (Lick and Manila), 16h. and 17h. (2) (near Manila), 19h. (Rio Tinto and Manila), 20h. (Manila), 21h. (Lick and La Paz).

Mar. 29d. 22h. 11m. 45s. Epicentre 46° 5' N. 151° 5' E. (as on 1920 June 10d.).

A = -0.605, B = +0.328, C = +0.725; D = +0.477, E = +0.879;
G = -0.638, H = +0.346, K = -0.688.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	6.0	274	2 53	? 8	(2 53)	+ 9	4.6	5.7
Hakodate	E. 9.1	242	e 2 19	+ 1	—	—	e 4.4	5.0
Mizusawa	E. 10.6	229	2 22	-16	7 3	?	—	—
	N. 10.6	229	2 26	-12	7 6	?	—	—
Tokyo	E. 14.0	223	e 2 21	-65	—	—	e 7.7	—
Osaka	E. 16.9	232	4 7	+ 3	7 34	+18	9.8	10.6

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Kobe	E.	17.1	232	e 2 52	-74	—	—	9.0	9.5
	N.	17.1	232	2 51	-75	—	—	9.1	—
Zi-ka-wei		27.7	247	e 5 54	-11	e 10 24	-30	—	19.3
Taihoku		32.1	241	—	—	e 12 15	+ 5	—	—
Manila		40.8	230	e 9 38	+97	—	—	—	—
Honolulu	E.	47.7	103	—	—	15 27	-23	e 24.0	26.4
Victoria		54.5	53	—	—	—	—	—	36.9
Batavia		65.9	233	e 9 51	-59	e 19 23	-13	—	—
Kodaikanal		71.7	270	49 3	?L	—	—	(49.0)	—
Tucson		71.8	62	e 12 24	+56	—	—	—	—
Colombo		72.4	266	50 15	?L	—	—	(50.2)	54.2
Lemberg		73.4	327	—	—	e 20 51	-16	42.8	50.0
Hamburg		74.7	337	e 11 45	- 2	—	—	e 40.2	44.4
Chicago		77.3	40	—	—	—	—	45.2	—
Stonyhurst		77.3	346	e 22 3	?S (e 22 3)	—	+11	—	51.2
Budapest		77.3	330	e 11 51	-12	—	—	e 44.2	46.2
De Bilt	E.	77.3	340	—	—	22 3	+11	e 41.2	44.1
	N.	77.3	340	—	—	—	—	e 42.2	51.6
Vienna		77.5	331	i 12 2	- 2	e 24 33	?	e 45.2	56.4
Ann Arbor		78.6	38	—	—	—	—	e 37.4	—
Uccle		78.6	340	e 12 8	- 3	e 22 9	+ 2	e 37.2	47.2
Ottawa	E.	79.1	31	—	—	e 22 11	- 2	e 37.2	—
Kew		79.1	345	—	—	—	—	—	59.2
Toronto		79.2	35	—	—	—	—	e 44.8	51.4
Strasbourg		79.9	337	—	—	—	—	e 45.2	—
Riverview		80.3	181	e 10 9	?	e 22 9	-18	e 45.0	51.6
Paris		80.9	341	—	—	—	—	e 44.2	47.2
Florence		83.1	334	—	—	—	—	—	34.2
Moncalieri		83.1	336	—	—	e 23 51	+53	46.7	49.8
Harvard	E.	83.4	30	—	—	44 53	?L	e 51.2	—
Rocca di Papa		84.5	330	e 12 45	0	e 23 9	- 5	e 49.0	58.2
Pompeii		84.7	328	—	—	—	—	54.2	—
Helwan	E.	86.5	311	22 15	?S (22 15)	—	-81	—	—
Tortosa		88.9	340	—	—	—	—	e 48.2	52.6
Vera Cruz		90.5	60	—	—	—	—	29.2	—
Algiers		92.0	336	—	—	—	—	e 45.2	57.8
Rio Tinto		93.5	344	56 15	?L	—	—	(56.2)	60.2
La Paz		135.6	61	23 11	?PR ₁	—	—	—	—

Additional readings: Ootomari gives also MN = +6.6m. Osaka MN = +11.2m. Zi-ka-wei MN = +19.1m. Honolulu LN = +21.6m. Batavia e = +14m.38s. Tucson ePN = +12m.30s. Lemberg gives its reading as 28d. Hamburg MN = +44.0m., MZ = +51.2m. Ann Arbor LN = +37.6m. Ottawa e?E = +31m.0s. and 4 other L's. Toronto eL = +50.8m., L? = +70.2m. and +81.2m. Riverview MN = +46.4m. Moncalieri S? = +38m.5s. Harvard L = +52.5m.

Mar. 29d. Readings also at 1h. (Lick), 3h. and 5h. (Wellington), 10h. (Taihoku), 15h. (near La Paz), 16h. (La Paz and near Tokyo), 17h. (Helwan and Batavia), 23h. (near Tacubaya and Oaxaca).

Mar. 30d. 10h. 26m. 30s. Epicentre 22° 2'N. 93° 2'E. (as on 1920 Aug. 15d.).

A = -.052, B = +.924, C = +.378; D = +.998, E = +.056;

G = -.021, H = +.377, K = -.926.

Very rough.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta	E.	4.5	275	0 42	-28	—	—	1.4	4.4
Simla		16.8	306	e 4 12	+10	7 0	-13	—	—
Kodaikanal		19.3	234	5 48	+75	—	—	11.7	20.7
Bombay		19.4	264	3 48	-46	7 17	-53	8.5	—
Colombo		20.0	222	8 30	?S	(8 30)	+ 7	13.0	14.5
Taihoku		26.1	78	—	—	—	—	e 15.6	—
Zi-ka-wei		26.6	64	e 5 56	+ 2	e 10 48	+15	—	18.0
Manila		27.4	101	e 6 8	+ 6	—	—	—	—
Batavia		31.4	155	e 6 31	-11	—	—	—	13.7
Helwan		55.5	292	17 30	?S (17 30)	—	+ 2	—	—
Lemberg		59.9	318	—	—	—	—	e 26.0	42.6
Vienna		65.0	317	i 10 30	-15	—	—	—	46.7
Hamburg		68.3	323	—	—	—	—	e 27.5	49.5

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
De Bilt	71.5	320	—	—	e 29 30	?	e 39.5	42.3
Uccle	72.2	320	—	—	—	—	e 35.5	42.5
Kew	74.9	321	—	—	—	—	—	36.5
Stonyhurst	75.4	321	e 30 30	?L	—	—	(e 30.5)	54.5
Eskdalemuir	75.4	325	—	—	—	—	39.5	43.5
Oxford	75.4	321	—	—	—	—	—	50.7
Wellington	98.5	132	e 52 48	?L	e 58 48	?	(52.8)	—
La Paz	161.5	285	20 5	[- 4]	—	—	76.5	104.0

Additional readings and notes : Colombo gives also S = +11m.30s. De Bilt
eLN = +36.5m. Eskdalemuir MN = +44.5m.

1921. Mar. 30d. 15h. 2m. 10s. Epicentre 7°·6S. 128°·3E.

(suggested by Batavia).

A = -·614, B = +·778, C = -·132; D = +·785, E = +·620;
G = +·082, H = -·104, K = -·991.

A depth of focus 0.040 is assumed.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	s.	m.	m.
Batavia	-1.7	21.3	272	4 35	- 1	e 8 18	+ 3	—	9.0
Manila	-1.9	23.3	342	e 4 58	0	8 9	-44	9.2	9.2
Perth	-2.3	27.0	204	6 21	+46	(9 26)	-31	9.4	—
Adelaide	-2.5	29.0	162	—	—	i 10 32	0	12.0	18.8
Taihoku	-2.9	33.3	350	e 7 24	+52	(11 22)	-19	11.4	—
Riverview	-2.9	33.7	143	e 6 38	+ 2	i 11 46	- 2	e 12.8	21.6
Sydney	-2.9	33.7	143	6 38	+ 2	11 38	-10	18.8	21.9
Melbourne	-2.9	33.8	154	e 6 44	+ 7	i 12 2	+12	13.3	21.7
Zi-ka-wei	-3.3	39.3	353	e 7 20	- 2	e 12 40	-30	e 16.3	20.0
Kobe	-3.5	42.8	9	7 43	- 6	13 52	- 4	17.5	18.4
	N. -3.5	42.8	9	7 43	- 6	13 53	- 3	17.2	17.8
Osaka	-3.5	42.8	9	7 55	+ 6	14 4	+ 8	—	18.2
Tokyo	-3.6	44.6	13	7 46	-17	14 15	- 6	—	—
Jinsen	-3.6	45.1	359	8 0	- 7	12 19	-129	—	18.3
Mizusawa	-3.9	48.2	13	8 26	- 2	15 11	+ 5	—	—
Calcutta	-4.0	49.4	310	8 50	+14	—	—	21.2	—
Colombo	-4.0	50.4	285	(8 50)	+ 7	8 50	? P	15.8	22.3
Hakodate	-4.0	50.6	12	e 8 8	-36	—	—	—	—
Wellington	-4.2	53.2	138	e 9 14	+14	i 16 14	+ 8	28.8	31.8
Kodaikanal	-4.3	53.7	290	8 38	-25	—	—	19.3	42.0
Apia	-4.6	59.1	100	9 58	+22	17 56	+41	32.8	—
Bombay	-4.6	60.7	299	10 2	+15	—	—	—	—
Honolulu	-5.1	77.8	66	e 11 49	+15	i 21 27	+29	e 35.8	38.3
Helwan	-5.7	99.8	300	—	—	—	—	—	61.0
Lemberg	-5.8	105.0	320	—	—	e 27 32	+104	—	28.5
Victoria	—	107.8	40	—	—	19 5	? PR ₁	28.9	57.0
Budapest	—	108.5	319	—	—	—	—	e 28.8	—
Vienna	—	110.2	320	i 18 41	? PR ₁	28 28	+58	e 54.8	58.8
Hamburg	—	112.6	326	—	—	—	—	e 42.8	58.7
Rocca di Papa	—	114.0	313	e 19 24	? PR ₁	(e 29 16)	+74	—	—
Florence	—	114.6	316	—	—	—	—	—	58.8
De Bilt	—	115.9	325	e 19 45	? PR ₁	e 29 17	+60	e 58.8	61.2
Moncalieri	—	116.7	317	17 30	?	26 47	-97	47.1	—
Uccle	—	116.9	323	—	—	i 30 40	? SR ₁	—	63.1
Dyce	—	117.3	333	—	—	—	—	59.8	—
Edinburgh	—	118.5	331	—	—	—	—	—	62.1
Paris	—	118.8	322	—	—	e 28 50?	+10	59.8	62.8
Stonyhurst	—	119.2	329	—	—	—	—	—	65.3
Oxford	—	119.6	327	—	—	i 29 37	+51	e 36.4	62.8
Barcelona	—	121.7	315	—	—	—	—	e 59.8	—
Algiers	—	122.5	310	e 19 43	? PR ₁	—	—	e 49.8	79.3
Tortosa	—	123.1	315	—	—	—	—	e 49.8	65.8
Granada	—	127.4	312	19 7	[- 5]	27 10	-153	—	—
Coimbra	—	129.5	318	22 20	? PR ₁	33 11	?	e 45.8	69.7
Chicago	—	133.4	35	21 15	? PR ₁	28 5	?	e 38.8	—
Toronto	—	136.6	28	—	—	—	—	e 77.1	82.4
Ottawa	—	136.9	22	i 19 11	[- 23]	e 31 44	?	71.8	—
Ithaca	—	138.9	26	—	—	—	—	98.8	—
Harvard	—	141.2	21	—	—	—	—	57.8	—
Georgetown	E.N. —	141.3	30	e 19 21	[- 21]	22 59	? PR ₁	—	—
Washington	—	141.3	30	e 21 17	? PR ₁	—	—	—	—
La Paz	—	150.9	146	19 40	[- 17]	34 3	?	74.8	78.2

For Notes see next page.

NOTES TO MAR. 30d. 15h. 2m. 10s.

Additional readings: Manila gives also MN = +9.4m. Riverview iS = +11m.56s., PS = +12m.14s., MN = +21.9m. Zi-ka-wei MN = +20.8m. Osaka MN = +17.6m. Mizusawa PN = +8m.27s. Colombo P = +3m.50s. Wellington e = +14m.2s., i = +17m.2s., +19m.38s., and +21m.32s. Honolulu SN = +22m.9s. Hamburg MN = +58.9m., MZ = +67.5m. De Bilt MN = +60.9m. Epicentre 7° 6S. 128° 3E. Paris MN = +64.8m. Toronto eL = +80.4m. and +100.6m. Ottawa PR₁EV = +21m.50s., eSV = +33m.54s., eLE? = +57.8m., LE = +62.8m. and +82.8m., L (rep.) = +117.8m.

Mar. 30d. 15h. 5m. 30s. Epicentre 41° 0N. 23° 0E.

A = +.695, B = +.295, C = +.656; D = +.391, E = -.920;

G = +.604, H = +.256, K = -.755.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3.1	170	1 43	?S	i 2 38	?	e 3.0	3.7
Pompeii	6.4	271	1 48	+10	2 37	-18	3.5	4.5
Budapest	7.1	338	i 2 6	+18	—	—	e 5.1	5.7
Pola	7.7	303	e 1 38	-19	(e 2 59)	-30	e 3.0	3.5
Rocca di Papa	7.8	279	i 2 2	+4	i 3 20	-11	4.2	—
Vienna	8.6	329	i 2 20	+10	i 3 17	-36	i 4.4	5.7
Lemberg	8.9	4	e 4 0	?S	(e 4 0)	-1	—	—
Florence	9.1	292	2 30	+12	4 45	?L	(4.8)	—
Padova	9.2	302	2 30	+11	4 37	?L	(4.6)	—
Milan	11.0	299	3 7	+23	4 25	-29	—	6.8
Moncalieri	11.8	295	2 59	+3	5 22	+8	6.4	8.0
Zurich	12.1	307	e 3 0	0	i 5 0	-21	—	—
Helwan	13.0	146	7 12	?L	—	—	(7.2)	—
Strasbourg	13.1	310	e 3 16	+2	e 5 56	+10	e 6.4	7.2
Besançon	13.7	303	3 20	-2	6 42?	?L	(6.7?)	9.5
Konigsberg z.	13.9	354	i 3 41	+16	—	—	8.0	—
Hamburg	15.3	330	e 3 48	+5	—	—	i 8.4	10.3
Barcelona	15.7	278	—	—	e 5 2	?	e 7.8	10.5
Algiers	16.0	261	i 3 57	+5	6 49	-6	8.5	10.2
Ucele	16.2	314	e 3 53	-2	—	—	7.6	8.7
Paris	16.4	306	e 4 6	+9	e 7 40	+36	8.5	8.5
De Bilt	16.5	318	—	—	—	—	8.3	10.2
Tortosa	16.9	277	—	—	—	—	8.9	10.8
Kew	19.1	311	—	—	—	—	—	12.5
Oxford	19.8	311	4 8	-31	i 8 15	-4	9.7	11.0
Granada	20.9	268	5 14	+22	7 40	-62	—	—
Stonyhurst	21.3	316	i 11 21	?L	—	—	(i 11.4)	—
Eskdalemuir	22.4	319	—	—	(9 30)	+17	9.5	—
Edinburgh	22.6	320	—	—	—	—	11.5	—
San Fernando E.	23.1	268	5 6	-12	—	—	—	13.2
Coimbra	23.8	279	5 31	+5	9 35	-5	e 13.2	—
Simla	44.2	85	e 7 0	-87	e 15 0	-5	—	23.1
Toronto	70.4	312	e 12 54	+95	i 18 6	?PR ₁	e 29.4	30.9

Additional readings: Athens gives also PE = +2m.1s., PN = +2m.3s., iSN = +2m.43s., MN = +3.5m., T₀ = 15h.6m.5s. Padova PR₁ = +3m.50s. and +4m.10s., SR₁ = +4m.54s. Moncalieri MN = +7.8m. Strasbourg MN = +7.1m. Konigsberg ePZ = +7m.13s. Hamburg MN = +9.5m. Barcelona MN = +11.6m. De Bilt MN = +9.2m. San Fernando MN = +14.2m. Toronto i = +23m.54s., eL = +46.4m.

Mar. 30d. Readings also at 9h. (Simla), 17h. (Lick and Taihoku), 22h. (near Taihoku).

Mar. 31d. Readings at 4h. (Taihoku), 6h. (near La Paz), 7h. (near Mizusawa), 10h. (Barcelona and Dehra Dun), 11h. (Mizusawa), 13h. (La Paz (2)), 17h. (La Paz), 19h. (Apia).

Belated Readings.

The following readings arrived too late to be entered in their places in the Bulletins:—

BELGRADE 44°49'N. 20°27'E.

Date.	Epicentre.		Δ	P.	O—C.	S.	O—C.	L.	M.
d. h.	°	°	°	m. s.	s.	m. s.	s.	m.	m.
Jan. 16 23	38°8'N.	32°9'E.	11·0	2 43	— 1	5 8	+14	—	6·4
Jan. 27 11	36°0'N.	28°0'E.	10·5	2 14	—23	5 16	+33	5·8	6·0
Feb. 4 8	16°5'N.	89°5'E.	91·8	e 12 33	—53	e 22 27	—126	e 27·5	47·0
Mar. 24 14	50°5'N.	159°0'E.	79·3	e 12 5	—10	e 18 1	? PR ₁	39·8	49·0
Mar. 28 7	14°5'N.	86°0'W.	91·1	i 12 38	—44	i 23 42	—43	e 40·8	47·0
Mar. 30 15	41°0'N.	23°0'E.	4·2	1 27	+22	2 14	+19	—	2·6

MOSTAR 43°21'N. 17°49'E.

Mar. 30 15	41°0'N.	23°0'E.	4·5	i 1 10	0	i 1 54	—10	—	2·8
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SARAJEVO 43°52'N. 18°26'E.

Mar. 30 15	41°0'N.	23°0'E.	4·8	i 1 16	+ 2	e 1 56	—15	—	2·0
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Additional Readings.

JANUARY.

30d. 0h. (Belgrade), 7d. 0h. (Belgrade), 8d. 2h. (Mostar and Sarajevo), 15d. 10h. (Belgrade and Sarajevo), 22d. 9h. and 12h. (Belgrade), 30d. 13h. (Belgrade).

FEBRUARY.

1d. 22h. (Sarajevo), 6d. 5h. (Belgrade), 6d. 20h. (Mostar), 8d. 20h. (Belgrade), 9d. 0h. (Belgrade), 10d. 15h. (Belgrade), 17d. 23h. (Mostar), 9d. 20h. (2) and 21h. (Belgrade), 21d. 14h. and 18h. (Belgrade), 22d. 20h. (Belgrade), 25d. 17h. and 18h. (Belgrade), 26d. 13h., 14h., 16h., and 18h. (Belgrade), 27d. 20h. (Belgrade), 28d. 15h. and 17h. (Belgrade).

MARCH.

5d. 16h. (Belgrade), 11d. 22h. (Mostar), 12d. 1h. (Mostar), 20d. 19h. (Sarajevo), 21d. 7h. (Mostar and Sarajevo).

The following additional earthquake is suggested by the belated readings:—

Jan. 8d. 2h. 0m. 30s. Epicentre 44°·6'N. 13°·3'E. (as on 1920 June 4d.).

	Δ	P.	O—C.	S.	O—C.	M.
	°	m. s.	s.	m. s.	s.	m.
Rocca di Papa	2·9	0 42	— 3	—	—	2·8
Mostar	3·5	0 57	+ 2	1 33	— 4	2·1
Sarajevo	3·7	1 0	+ 2	1 36	— 6	1·9

Observatories are urgently requested to send to Oxford as soon as possible readings for the years 1921 & 1922, so that the lists may be made complete without the need for these supplements.

It has been suggested that it may be convenient to give here the

International Code for Transmission of Seismic Telegrams.

Four groups of five figures are used . . . thus :—

dd	aa	pp	hh	mm	ss	ddd	D,D,DDD.
dd = day of the month							
aa = azimuth.							
pp = nature of the phases P and S.							
hh = hour							
mm = minutes							
ss = seconds							
} in Greenwich mean time for the commencement of the seismogram (P).							
ddd = S - P in seconds.							
D,D, = \bar{P} - P ,, ,, for near shocks.							
DDD = distance in kilometres of near shocks.							
D,D,DDD = ,, ,, ,, ,, distant shocks.							

Explanations.

aa azimuths. These figures $\times 10$ = degrees from North through East (figures used are 1 to 36). If the azimuth is uncertain to 180° , then 50 is added to the figures in the telegram = 51 to 86. If the estimate of the azimuth is uncertain and one cannot indicate nearer than 45° , each 45° from North through East is indicated by the figures 91 to 98.

99 means not yet determined.

00 ,, estimate of azimuth impossible.

pp nature of P and S.

First figure refers to P (1 to 4 used).

1 = iP; *very* clear.

2 = P and \bar{P} both clear.

3 = P; clear but without impetus.

4 = eP; badly defined.

The second figure refers to S (5 to 8 are used).

5 = iS, S sharp impetus and *very* clear.

6 = clear.

7 = badly defined.

8 = S uncertain.

The figure 9 in either place means lost in time mark.

Example. 20991 50051 33393 04830

= 20th of the month, azimuth not yet determined, iP iS. P commencing
0hrs. 51m. 33sec. after midnight. S - P = 393 seconds. Distance 4830
kilometres.

The International Seismological Summary for 1921 April, May, June.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number of the Summary deals with 65 epicentres, 29 of which are new and 36 repetitions from old epicentres. The corresponding figures for former periods are :

	New	Old
1913-1920 March	597	550
1920 April—June	27	48
July—Sept.	31	49
Nov.—Dec.	27	42
1921 Jan.—Mar.	31	30
Apr.—June	29	36

The number of new epicentres is thus remarkably steady.

There are only two cases of presumed abnormal focal depth :

April 25d.17h. 22°·0S. 180°·0 Depth +·040

May 20d. 0h. 35°·0N. 69°·0E. Depth +·030

to which may be added a suspected case of *high* focus on May 20d.13h., where, however, the material is not sufficient to establish the point.

The epicentre of 1921 April 25d.17h. was adopted on 1917 May 24d. 19h. 20m. 30s. with the note "the hypocentric stations suggest a deep focus, but the epicentric material is scarcely good enough to warrant refinement." For 1917 May 24 we have records from 27 stations ; and for 1921 April 25d. from 38 stations. It might be supposed that there would be a sufficient number of cases where either P or S could be directly compared to give a definite answer to the question of identity. But there are only the following :—

Δ		1917 May 24	1921 April 25	Diff.
°		m. s.	m. s.	s.
68·5	Manila P	+11 10	+11 1	+ 9
72·1	Batavia P	+10 59	+10 51	+ 8
151·0	Uccle [P]	+19 24	+19 26	— 2
153·2	Paris [P]	+18 32	+19 33	—61
157·6	Rocca [P]	+18 56	+19 45	—49

This evidence is suggestive, but far from conclusive. Similarly the epicentre of 1921 May 20d. (49 stations) was used on 1920 Feb. 27 (25 stations): but the cases available for direct comparison are limited to the following:—

	Δ	Az.	P.	S.		Δ	Az.	S.
	$^{\circ}$	$^{\circ}$	s.	s.		$^{\circ}$	$^{\circ}$	s.
Calcutta	21.0	122	+22	+34	De Bilt	47.6	312	+ 6
Pompeii	42.7	296	— 3	—	Uccle	48.2	310	— 9
Strasbourg	46.3	307	+20	—	Coimbra	59.6	300	+25
Moncalieri	46.8	302	+76	+131				

Such instances show how far we are still from having satisfactorily complete readings for direct comparison of one shock with another, suspected of being from the same epicentre. The accuracy of the records is improving considerably, especially since the institution of wireless time-signals: but it still leaves much to be desired.

Those observers who have not already communicated their readings for 1921 and 1922 are urgently requested to send them without delay to the University Observatory, Oxford.

H. H. TURNER.

University Observatory, Oxford.
1925 June 10.

1921 APRIL, MAY, & JUNE.

1921. April 1d. 4h. 6m. 40s. Epicentre 2°·4N. 98°·8E.

(suggested by Batavia).

A = -·153, B = +·987, C = +·042; D = +·988, E = +·153;

G = -·006, H = +·041, K = -·999.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	11·8	137	i 2 49	- 7	e 5 15	+ 1	i 6·4	7·2
Colombo	19·4	284	5 20	+46	8 20?	+10	10·3	13·3
Calcutta	22·5	334	5 14	+ 3	(9 38)	+23	9·6	15·0
Kodaikanal	22·6	291	4 50	-22	(8 56)	-21	8·9	12·5
Manila	25·0	60	e 5 34	- 4	10 4	+ 1	12·1	14·0
Bombay	30·2	307	6 18	-12	11 19	-18	—	18·7
Taihoku	31·5	42	—	—	e 11 39	-21	19·2	23·5
Dehra Dun	34·2	328	10 50	?	—	—	—	—
Zi-ka-wei	35·8	35	e 8 33	+73	e 12 53	-14	e 14·4	21·1
Nagasaki	42·0	40	e 18 0	?SR ₁	—	—	22·4	—
Hukuoka	42·9	40	10 18	?PR ₁	—	—	20·8	23·7
Jinsen	43·3	34	8 1	-19	17 23	?SR ₁	—	25·4
Kobe	46·7	43	9 6	+21	—	—	24·2	29·2
	46·7	43	8 53	+ 8	—	—	24·2	26·7
Osaka	46·9	43	9 37	+51	19 7	?SR ₁	27·1	31·4
Tokyo	50·4	44	e 8 19	-50	20 5	?SR ₁	30·1	35·6
Adelaide	52·8	139	—	—	i 20 26	?SR ₁	e 24·1	36·0
Mizusawa	53·1	41	9 21	- 6	16 19	-38	—	—
	53·1	41	9 56	-31	16 46	-11	—	—
Ootomari	58·4	35	26 6	?L	29 28	?	32·7	34·8
Melbourne	58·6	139	e 17 20	?S (e 17 20)	-46	e 30·3	40·0	40·0
Riverview	61·2	133	—	—	e 18 29	- 9	e 26·5	30·0
Sydney	61·2	133	23 20	?	30 2	?L	40·2	41·4
Helwan	69·3	301	10 50	-23	—	—	—	41·2
	69·3	301	16 38	?PR ₁	—	—	—	39·5
Athens	76·8	310	e 11 51	- 9	22 39	+52	e 40·3	—
Lemberg	78·4	321	e 21 56	?S (e 21 56)	- 9	e 38·7	69·5	69·5
Wellington	81·1	134	—	—	e 22 32	- 4	e 40·3	47·3
Budapest	81·3	319	e 12 46	+19	e 23 8	+30	e 41·3	53·3
Vienna	83·1	320	i 12 30	- 7	22 49	- 9	e 40·3	72·1
Cape Town	83·3	236	—	—	—	—	—	53·3
Pompeii	84·1	311	12 36	- 7	22 36	-33	—	—
Pola	84·7	316	e 12 18	-28	e 22 46	-30	e 38·3	—
Rocca di Papa	85·5	313	12 40	-11	i 23 7	-18	e 43·4	70·7
Padova	86·1	317	12 54	0	23 26	- 5	—	74·7
Florence	86·6	315	23 20	?S (23 20)	-17	36·2	53·3	53·3
Hamburg	87·4	324	e 13 16	+15	e 23 28	-17	e 40·3	56·5
Zurich	88·4	318	e 12 57	-10	e 23 23	-33	—	—
Strasbourg	88·9	319	e 12 46	-24	e 23 34	-28	e 36·3	61·0
Moncalieri	89·0	315	12 28	-42	23 37	-26	36·6	51·9
Besançon	90·2	318	—	—	23 45?	-31	37·3	—
De Bilt	90·3	322	13 14	- 4	23 44	-33	e 43·3	58·2
Marseilles	90·9	314	—	—	e 23 40	-43	e 37·3	—
Uccle	90·9	321	e 13 10	-11	24 1	-22	37·3	49·1
Paris	92·3	320	e 13 15	-14	e 23 53	-45	38·3	65·3
Algiers	93·1	309	e 13 3	-30	23 47	-59	e 52·3	55·8
Barcelona	93·4	313	—	—	e 24 28	-21	e 49·0	72·1
Kew	93·7	322	—	—	—	—	—	64·3
Dyce	93·8	329	—	—	24 50	- 4	47·3	53·3
Oxford	94·4	322	i 13 28	-12	23 58	-62	46·7	61·3
Stonyhurst	94·6	324	e 18 50	?PR ₁	—	—	—	63·3
Edinburgh	94·6	326	—	—	24 20	-42	50·3	61·4
Eskdalemuir	94·8	326	—	—	i 24 56	- 8	39·0	57·9
Tortosa	95·1	312	13 40	- 4	24 12	-55	38·5	82·5
Granada	98·4	309	e 18 29	?PR ₁ (e 26 32)	+52	e 26·5	—	—
San Fernando	100·6	309	17 8	?	—	—	—	62·3

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Victoria	117.4	30	—	—	43 28	?SR ₁	53.3	65.6
Ottawa	132.0	354	i 22 47	?PR ₁	e 38 58	?SR ₁	63.3	—
Toronto	133.9	359	—	—	—	—	72.8	89.7
Ithaca	135.0	355	—	—	61 20	? e	72.3	—
Ann Arbor	E. 135.2	2	—	—	—	—	71.2	—
Chicago	135.4	6	i 22 50	?PR ₁	33 28	? e	71.3	—
Harvard	E. 134.3	350	—	—	e 46 48	?SR ₁	e 62.7	71.5
Washington	138.5	355	—	—	—	—	68.3	—
Georgetown	138.5	355	—	—	e 46 20	?SR ₁	e 61.8	—
La Paz	160.9	221	e 20 8	[- 1]	34 20	? e	74.6	109.6

Additional readings: Batavia gives also eL = +14.7m. Manila MN = +12.3m. Taihoku, the S is given as e, also s = +14m.39s. Zi-ka-wei MN = +21.2m. Adelaide e = +15m.44s., i = +28m.2s., and +28m.59s., e = +32m.14s. Melbourne eS = +23m.50s. Riverview eP? = 4h.6m.30s., MZ = +41.3m. Athens iN = +22m.43s. Wellington e = +27m.32s. and +35m.14s. Vienna iPZ = +12m.26s., iNE = +23m.2s. MN = +61.3m. Padova PR₁ = +14m.47s., SR₁ = +25m.8s. Hamburg MN = +46.3m., MZ = +56.7m. Strasbourg MN = +52.6m. De Bilt eN = +23m.57s., MN = +56.8m. Paris MN = +47.3m. Oxford i = +17m.19s. Eskdalemuir iN = +25m.36s. Granada eP = 4h.6m.30s. San Fernando MN = +61.5m. Ottawa eLE = +54.8m., LN = +65.3m. Toronto e = +61m.32s. and +69m.44s., eL = +76.9m., 83.8m., and +88.7m. Chicago eL = +53.3m. Harvard L = +67.3m., and +80.3m. Washington L = +74.3m. La Paz iPV = +20m.14s., L = +71.5m., T₀ = 4h.7m.42s.

1921. April 1d. 12h. 0m. 24s. Epicentre 11°-7S. 166°-3E.

(as on 1920 May 20d.).

$$A = -.952, B = +.232, C = -.203; \quad D = +.237, E = +.972; \\ G = +.197, H = -.048, K = -.979.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia	21.5	98	5 22	+23	10 12	?L	(10.2)	12.6
Riverview	26.1	209	e 5 49	0	e 10 1	-23	e 11.1	13.6
Wellington	30.5	167	e 4 6	?	e 11 54	+11	14.6	16.9
Melbourne	32.3	211	e 6 30	-21	11 42	-31	14.1	20.6
Honolulu	E. 48.2	47	—	—	e 15 59	+ 3	19.9	25.0
	N. 48.2	47	—	—	e 15 51	- 5	19.8	24.3
Manila	52.1	300	e 9 14	- 7	(e 16 34)	-11	—	—
Tokyo	53.6	332	9 20	-10	i 14 55	-129	23.8	29.8
Osaka	54.9	329	9 43	+ 5	17 15	- 5	24.4	26.9
Kobe	55.3	329	9 30	-11	17 5	-20	20.2	—
Mizusawa	E. 56.0	340	9 35	-11	17 11	-23	—	—
	N. 56.0	340	9 38	- 8	17 14	-20	—	—
Taihoku	57.0	310	—	—	e 17 39	- 7	—	—
Batavia	58.9	270	e 10 5	+ 1	—	—	—	—
Zi-ka-wei	60.8	318	e 10 16	- 2	—	—	—	—
Berkeley	83.0	49	—	—	—	—	e 38.6	—
Lick	83.4	49	—	—	—	—	e 38.6	—
Calcutta	83.6	295	12 12	-28	—	—	—	—
Victoria	86.2	39	—	—	(23 30)	- 2	23.5	45.6
Chicago	109.7	50	18 54	?PR ₁	28 36	+71	e 48.6	—
Ann Arbor	112.6	49	—	—	—	—	58.3	—
Toronto	115.6	46	—	—	—	—	e 67.1	70.3
Ottawa	117.8	43	—	—	e 56 36	?	e 60.6	—
Washington	117.9	51	—	—	—	—	e 63.6	—
Georgetown	117.9	51	—	—	—	—	65.6	—
La Paz	119.2	117	19 16	[+26]	i 33 29	?	56.6	61.2
Harvard	E. 121.7	47	—	—	—	—	e 62.0	—
Hamburg	134.1	341	e 21 52	?PR ₁	—	—	e 63.6	74.6
Helwan	E. 134.5	301	21 36	?PR ₁	(23 36)	?	—	—
Budapest	134.9	330	e 17 36	?	—	—	—	—
Eskdalemuir	N. 135.6	352	e 21 49	?PR ₁	—	—	60.6	—
Vienna	135.7	333	i 19 33	[+ 2]	—	—	e 63.6	79.8
De Bilt	136.8	343	—	—	—	—	e 65.6	82.8
Uccle	138.2	343	e 22 17	?PR ₁	e 32 38	?	e 61.6	75.2

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Oxford	138.7	349	23 41	{PR ₁	—	—	60.6	79.0
Kew	138.8	349	—	—	—	—	—	82.6
Strasbourg	139.0	338	e 19 39	[+ 1]	—	—	e 69.6	89.1
Padova	139.9	332	20 58	?	—	—	—	—
Paris	140.5	345	19 45	[+ 5]	e 33 0	?	66.6	88.6
Besançon	140.8	338	22 36	{PR ₁	—	—	69.6	—
Florence	141.4	331	—	—	—	—	59.6	—
Pompeii	141.8	325	20 52	?	—	—	—	—
Moncalieri	142.0	337	19 44	[+ 1]	35 12	?	63.5	—
Rocca di Papa	142.1	329	i 19 47	[+ 4]	i 22 46	{PR ₁	79.6	—
Marseilles	144.4	336	—	—	—	—	74.6	—
Tortosa	148.3	340	19 54	[+ 1]	29 36	?	e 48.6	80.8
Algiers	150.7	332	20 3	[+ 6]	—	—	92.6	—
Coimbra	151.1	352	—	—	—	—	e 72.4	—
Rio Tinto	153.2	347	38 36	?	—	—	—	168.6

Additional readings: Apia gives also L = +11.6m. Riverview MZ = +16.7m.
 Manila records two eP's, which correspond to P and S. Kobe LN = +21.4m. Ann Arbor LN = +58.0m. (Wiechert) L = +58.5m.
 Toronto e = +52m.48s. and +60m.36s., L = +62.7m., eL = +87.2m.
 Ottawa L = +65.1m. Georgetown LN = +69.6m. Harvard e? = +43m.0s., eE = +54m.21s., L = +64.6m. Hamburg MN = +79.6m.
 Helwan gives its readings as PE and PN respectively. Eskdalemuir
 iN = +23m.6s. and +28m.59s., LN = +39.6m. Vienna iZ = +22m.4s.
 (?PR₁). De Bilt ePR₁ = +22m.15s., MN = +72.5m. Uccle iP = +22m.21s., MN = +84.7m. Strasbourg MN = +89.0m. Padova
 PR₁ = +24m.56s., +25m.51s. Paris PR₁ = +22m.37s., MN = +70.6m.
 Rocca di Papa L = +107.2m.

April 1d. Readings also at 2h. (Lick), 4h. (near Moncalieri), 6h. (near Rocca di Papa, Mostar, and Sarajevo), 7h. (near Rocca di Papa), 16h. (Helwan), 17h. (Eskdalemuir), 20h. (Rio Tinto and Rocca di Papa), 22h. (near Vera Cruz).

1921. April 2d. 9h. 36m. 45s. Epicentre 23°.3N. 122°.0E.

(as on 1919 Oct. 15d.).

A = -·487, B = +·779, C = +·396; D = +·848, E = +·530;
 G = -·209, H = +·335, K = -·918.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku	1.8	345	1 9	?S	(1 9)	+18	2.1	3.0
Hokoto	2.3	276	-e 0 59	?	-e 0 33	?	-0.1	0.0
Zi-ka-wei	7.9	356	2 8	+ 8	e 4 4	?L	(4.1)	7.9
Manila	8.8	186	e 2 18	+ 5	e 4 21	+23	4.8	8.4
Nagasaki	11.7	34	2 59	+ 4	—	—	6.2	8.7
Kobe	E. 16.1	42	3 31	-22	5 19	-98	9.8	10.7
	N. 16.1	42	3 32	-21	5 20	-97	9.5	10.5
Osaka	16.3	43	3 55	- 1	7 53	+51	10.6	11.0
Tokyo	19.7	47	4 14	-23	6 40	{PR ₁	7.6	8.2
Tyosi	20.5	48	4 20	-27	(7 53)	-41	7.9	—
Mito	20.6	46	4 22	-26	(7 48)	-48	7.8	10.4
Mizusawa	E. 22.6	41	4 40	-32	8 29	-48	—	—
	N. 22.6	41	4 43	-29	8 30	-47	—	—
Hakodate	24.2	35	e 5 9	-21	9 19	-29	9.3	9.8
Ootomari	28.7	30	5 48	-27	10 25	-47	12.9	17.2
Calcutta	E. 31.0	275	6 51	+13	11 51	0	18.2	21.2
Batavia	33.0	210	6 55	- 1	12 20	- 4	e 26.2	—
Simla	40.4	291	14 51	?S	(14 51)	+38	22.8	24.8
Colombo	43.7	256	10 15	{PR ₁	19 15	?	30.2	32.2
Kodaikanal	44.4	261	14 45	?S	(14 45)	-22	25.6	37.6
Perth	55.6	187	—	—	18 15	+46	—	—
Adelaide	60.4	166	e 9 27	-48	i 18 33	+ 5	e 28.8	35.0
Riverview	63.5	153	e 10 30	- 5	e 19 1	- 6	e 28.4	29.2
Sydney	63.5	153	18 27	?S	(18 27)	-40	29.0	29.8
Melbourne	64.8	160	e 11 21	+37	e 19 9	-14	28.8	40.0
Honolulu	E. 72.9	74	—	—	29 43	?	e 32.8	46.7

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Lemberg	77.3	320	e 12 3	0	e 22 3	+11	e 40.0	50.4
Helwan	79.2	298	12 33	+19	i 23 15	—	—	58.0
Budapest	81.3	319	i 12 51	+24	i 23 15	+37	e 42.2	—
Belgrade	81.5	316	e 12 34	+6	e 17 33	?PR ₁	e 35.5	57.8
Vienna	82.5	321	i 12 36	+3	22 53	+1	e 41.4	45.4
Hamburg	83.5	326	i 12 39	0	i 23 8	+5	e 40.2	46.4
Pola	85.6	319	e 22 59	?S	(e 22 59)	-27	e 43.2	59.0
Padova	86.6	320	13 7	+10	23 29	-8	45.4	56.9
De Bilt	86.7	326	e 13 1	+4	23 25	-13	40.2	48.9
Dyce	86.9	334	—	—	23 43	+3	—	48.1
Pompeii	87.2	314	13 31	+31	23 15	-28	—	—
Strasbourg	87.4	322	12 58	-3	e 23 47	+2	e 41.2	51.0
Victoria	87.7	37	—	—	—	—	41.2	59.4
Florence	87.8	318	—	—	23 15	-35	—	50.2
Uccle	87.8	325	e 13 0	-4	23 31	-19	e 40.2	47.2
Rocca di Papa	87.9	316	i 13 3	-1	i 23 53	+2	e 48.0	66.2
Edinburgh	88.3	331	16 39	?PR ₁	23 58	+3	—	60.0
Eskdalemuir	88.6	331	13 1	-7	23 35	-24	—	54.5
Besançon	89.1	322	13 39	+28	24 5	+1	45.2	—
Stonyhurst	89.2	330	16 45	?PR ₁	—	—	48.8	55.2
Moncalieri	89.3	320	13 10	-2	24 6	0	45.2	55.9
Kew	89.8	329	26 15	?SR ₁	—	—	—	63.2
Paris	90.0	324	e 13 14	-2	i 23 43	-31	42.2	48.2
Oxford	90.1	329	i 13 14	-3	23 41	-34	34.8	52.0
Marseilles	91.7	320	e 13 25	0	e 23 45	-47	e 41.2	51.5
Barcelona	94.7	319	—	—	e 24 52	-11	e 44.8	55.0
Tortosa	95.9	320	13 37	-11	24 20	-55	e 44.2	63.0
Algiers	96.8	315	e 13 17	-36	24 21	-63	50.2	62.9
Granada	100.8	319	18 50	?PR ₁	28 37	+154	—	—
Coimbra	101.4	324	18 5	?PR	28 5	+116	48.1	56.0
Rio Tinto	102.2	321	—	—	25 15	-62	—	62.2
San Fernando	102.8	320	—	—	27 33	+71	—	62.6
Ottawa	109.4	12	—	—	e 28 28	+65	e 48.2	—
Chicago	109.4	23	28 20	?S	(28 20)	+57	53.2	—
Toronto	110.2	15	—	—	—	—	i 62.4	71.4
Ann Arbor	110.2	19	—	—	(28 27)	+57	28.4	—
Harvard	113.1	10	—	—	e 28 15	+20	e 55.4	59.2
Georgetown	115.3	15	—	—	—	—	61.2	—
La Paz	168.3	57	i 20 17	[+ 3]	34 30	?	81.2	86.6

Additional readings: Zi-ka-wei gives also MN = +7.8m. Manila MN = +8.6m. Tokyo MN = +8.6m. Batavia i = +8m.32s., T₀ = 9h.36m.37s. Adelaide i = +20m.39s., +21m.15s., and +22m.15s., e = +24m.27s. and +33m.45s. Riverview eS = +19m.15s., MN = +35.0m. Helwan MN = +51.8m. Vienna MZ = +63.6m. Hamburg MN = +47.2m., MZ = +54.2m. Pola MN = +49.5m. Padova PR₁ = +14m.45s., +17m.35s., SR₁ = +24m.13s. De Bilt MN = +49.1m.; epicentre 22° 6'N. 123° 4'E. Strasbourg MZ = +57.7m. Uccle PR₁ = +16m.26s., SR₁ = +29m.45s., SR₂ = +34m.27s., MN = +49.6m. Rocca di Papa P = +16m.43s. Paris PR₁ = +16m.55s., i = +25m.24s. Oxford PR₁ = +16m.50s. Barcelona MN = +52.7m. Algiers PR₁ = +17m.44s., MN = +68.8m. Coimbra eLE = +38.0m., eLN = +38.1m., MN = +56.1m., T₀ = 9h.42m.48s. San Fernando MN = +70.0m. Chicago S? = +34m.9s., eL = +48.2m. Toronto iE = +47m.39s., eL = +74.2m. Harvard L = +57.8m.

April 2d. Readings also at 2h. (Berkeley, Zi-ka-wei, and near Taihoku), 3h. (De Bilt), 5h. (Vienna), 14h. (Barcelona), 22h. (La Paz), 23h. (La Paz, Helwan, and near Tokyo).

April 3d. Readings at 2h. (Honolulu, Georgetown, and Harvard), 3h. (De Bilt, Toronto, and La Paz), 4h. (Victoria), 5h. (Taihoku), 6h. (Helwan and near Algiers), 7h. and 16h. (La Paz), 18h. (Helwan).

April 4d. Readings at 9h. (near Tokyo), 10h. (Apia), 11h. (Riverview), 18h. (Harvard).

April 5d. 17h. 40m. 16s. Epicentre $44^{\circ}0'N$. $13^{\circ}0'E$. (as on 1918 Feb. 8d.).

$$A = +.701, B = +.162, C = +.695.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Florence	1.3	0 25	+ 5	—	—	—	0.6
Padova	1.6	0 38	+14	—	—	—	5.1
Rocca di Papa	2.2	i 0 35	+ 1	i 1 0	0	—	1.1
Pompeii	3.4	1 40	?L	—	—	(1.7)	—
Moncalieri	3.9	—	—	—	—	e 2.3	—
Vienna	4.8	e 2 44	?L	—	—	(e 2.7)	—

Additional readings: Florence reading given for 18h. Padova gives also
 $PR_1 = +5m.4s.$ Rocca di Papa iP = +0m.38s. Pompeii S = +2m.0s.

April 5d. Readings also at 0h. (Ann Arbor, Chicago, Ottawa, Washington, and near Tucson), 6h. (near Athens), 7h. (Taihoku), 8h. (Colombo), 10h. and 13h. (Helwan), 14h. (La Paz), 15h. (near Athens), 18h. (Harvard), 19h. (near Athens), 20h. (Helwan).

April 6d. Readings at 1h. (Manila), 4h. (Riverview), 8h. (La Paz), 9h. (near Athens), 12h. (Manila, La Paz, and near Athens), 13h. (Helwan and Taihoku), 14h., 16h., and 19h. (La Paz), 20h. (Vienna), 22h. (Helwan (2)).

April 7d. Readings at 5h. (near Algiers), 8h. (La Paz), 9h. (Rocca di Papa), 13h. (near Tokyo), 14h. (near Nagasaki (3)), 18h. (Harvard and La Paz), 19h. (Riverview and Algiers), 20h. (Helwan).

April 8d. Readings at 2h. (La Paz), 4h. (near Mizusawa and Tokyo), 5h. (Uccle and De Bilt), 14h. (near Mizusawa).

April 9d. Readings at 0h. (Helwan), 4h. (near Athens), 15h. (near Tacubaya), 19h. (Lick).

April 10d. 13h. 40m. 10s. Epicentre $53^{\circ}2'N$. $133^{\circ}7'W$.

$$A = -.414, B = -.433, C = +.801; \quad D = -.723, E = +.691; \\ G = -.553, H = -.579, K = -.599.$$

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Sitka	3.9	347	e 1 2	+ 1	e 1 37	-10	e 2.1	2.8
Victoria	8.1	122	2 58	+55	—	—	—	6.4
	8.1	122	3 50	?S	(3 50)	+10	—	5.3
Berkeley	E. 17.2	148	e 4 22	+15	e 7 12	-10	—	13.1
	N. 17.2	148	e 4 25	+18	e 7 15	-7	—	13.8
Lick	17.9	147	—	—	(e 7 48)	+10	e 7.8	—
Chicago	32.5	91	6 45	- 8	12 55	+39	17.8	—
St. Louis	32.9	98	e 16 20	?L	17 50	?	18.6	—
Ann Arbor	N. 34.5	88	8 38	+89	14 56	+128	19.9	21.1
Toronto	36.3	83	—	—	e 16 2	?SR ₁	19.7	20.4
Honolulu	E. 36.9	220	—	—	e 13 19	- 3	16.6	18.9
	N. 36.9	220	—	—	e 13 22	0	17.1	20.6
Ottawa	37.6	78	7 20	-15	13 13	-19	e 17.7	—
Ithaca	38.8	82	—	—	e 13 28	-21	e 19.2	—
Northfield	40.1	77	—	—	e 18 50	?L	20.8	—
Georgetown	40.6	88	e 7 0	-60	13 44	-31	e 16.9	25.4
Washington	40.6	88	—	—	e 16 50	+155	e 20.8	—
Cheltenham	E. 40.8	88	—	—	e 19 15	?L	25.1	25.6
	N. 40.8	88	—	—	e 21 34	?L	24.7	25.1
Fordham	41.3	83	—	—	i 21 52	?L	24.5	—
Tacubaya	E. 43.0	129	8 16	- 2	15 26	+38	23.4	27.7
Dyce	N. 62.7	27	—	—	—	—	33.8	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Edinburgh		63.6	30	e 10 40	+ 4	19 17	+ 9	30.8	40.4
Eskdalemuir		64.1	30	10 50	+11	—	—	—	—
Oxford		67.6	30	12 6	+64	20 26	+29	—	43.7
Kew		68.4	29	—	—	—	—	—	37.8
Hamburg		69.1	21	e 11 14	+ 2	—	—	e 40.8	—
De Bilt	E.	69.2	25	—	—	—	—	e 32.8	37.5
	N.	69.2	25	11 14	+ 2	20 29	+13	e 33.8	44.3
Uccle		70.2	26	e 11 19	+ 1	e 20 37	+ 9	e 32.8	39.8
Paris		71.5	29	11 27	0	20 54	+10	34.8	37.8
Strasbourg		73.1	25	e 11 34	- 3	21 14	+11	33.8	48.1
Moncalieri		76.4	27	e 9 48	?	21 48	+ 6	30.6	—
Barcelona		78.0	31	—	—	(e 21 39)	-21	e 21.6	—
Tortosa		78.1	33	12 6	- 2	22 5	+ 4	e 33.8	51.8
Rocca di Papa		80.8	25	i 12 23	- 1	i 22 38	+ 5	50.8	—
Algiers		82.6	32	e 12 40	+ 6	23 2	+ 9	41.8	47.3
Manila		87.2	290	21 50	?	—	—	—	—
La Paz		89.4	119	13 14	+ 2	23 58	- 9	45.3	53.2
Helwan		96.0	14	38 50	?	(23 50)	-86	—	—

Additional readings: Ann Arbor gives also LE = +19.8m. (B.O. and W.),
 ME = +21.8m. Georgetown LEN = +22.0m., MN = +25.2m. Chel-
 tenham iN = +21m.58s. Uccle SR₁ = +25m.9s.

April 10d. Readings also at 1h. (La Paz), 3h. (Batavia), 13h. (St. Louis), 16h. (Dyce), 17h. (near Mizusawa), 19h. (Helwan), 23h. (Ottawa).

April 11d. Readings at 0h. (near Tacubaya), 5h. (Hamburg and De Bilt), 8h. (Helwan), 10h. (Zi-ka-wei), 11h. (De Bilt), 12h. (Helwan, De Bilt, and near Tokyo and Mizusawa), 13h. (La Paz), 19h. (Rio Tinto and Helwan), 23h. (Taihoku).

April 12d. 7h. 29m. 10s. Epicentre $53^{\circ}2'N$. $133^{\circ}7'W$. (as on April 10d.).

A = -414, B = -433, C = +801; D = -723, E = +691;
 G = -553, H = -579, K = -599.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Sitka	E.	3.9	347	—	—	(1 40)	- 7	1.7	2.5
	N.	3.9	347	—	—	(1 50)	+ 3	1.8	2.7
Victoria		8.1	122	3 5	+62	—	—	—	4.6
Berkeley		17.2	148	e 4 0	- 7	e 7 8	-14	—	—
Lick		17.9	147	e 5 50	?	—	—	—	—
Tucson	E.	26.6	133	—	—	—	—	e 15.0	—
Chicago		32.5	91	11 25	?S	(11 25)	-51	17.3	—
St. Louis		32.9	98	16 50	?L	18 8	?	19.2	20.7
Ann Arbor	E.	34.5	88	—	—	—	—	23.4	—
Toronto		36.3	83	—	—	—	—	i 19.4	19.8
Honolulu	E.	36.9	220	—	—	—	—	16.5	23.0
	N.	36.9	220	—	—	—	—	e 16.8	22.5
Ottawa		37.6	78	i 19 20	?L	—	—	e 19.8	—
Ithaca		38.8	82	—	—	—	—	e 17.0	—
Northfield		40.1	77	—	—	—	—	e 19.4	—
Georgetown		40.6	88	—	—	—	—	e 18.8	—
Washington		40.6	88	10 44	?	—	—	20.8	—
Cheltenham	E.	40.8	88	—	—	—	—	e 21.4	23.5
	N.	40.8	88	—	—	—	—	e 20.9	23.4
Edinburgh		63.6	30	—	—	(e 18 50)	-18	e 18.8	39.8
Oxford		67.6	30	—	—	19 55	- 2	33.2	39.0
De Bilt		69.2	25	e 11 16	+ 4	20 18	+ 2	e 36.8	37.4
Paris		71.5	29	e 11 33	+ 6	20 50	+ 6	38.8	40.8
Vienna		75.5	19	11 42	-10	—	—	e 51.8	—
Rocca di Papa		80.8	25	e 12 15	- 9	e 22 56	+23	—	23.9
La Paz		89.4	119	13 0	-12	—	—	—	—

Additional readings: Chicago gives also S = +15m.38s. Ann Arbor LN = +22.9m. Ithaca e = +19m.50s., L = +20.6m. Toronto iL = +22.1m. Georgetown iE = +26m.50s. Cheltenham eE = +22m.21s. De Bilt MN = +39.7m. Rocca di Papa iPN = +12m.17s.

April 12d. 9h. 36m. 0s. Epicentre $37^{\circ}2'N$. $101^{\circ}4'E$.

A = -157 , B = $+781$, C = $+605$; D = $+980$, E = $+198$;

G = -120 , H = $+593$, K = -797 .

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Zi-ka-wei	17.6	104	e 4 14	+ 2	e 7 32	+ 1	—	11.7
Jinsen	19.9	81	4 22	-18	7 57	-24	10.4	—
Simla	20.9	261	—	—	e 8 48	+ 6	—	13.0
Taihoku	21.1	120	—	—	e 8 40	- 6	11.2	—
Osaka	27.6	85	—	—	10 14	-38	—	17.8
Manila	28.6	137	—	—	e 12 34	+84	18.7	—
Colombo	36.1	220	22 0	?L	—	—	(22.0)	27.0
Batavia	43.7	173	e 8 25	+ 1	i 15 1	+ 3	i 25.7	—
Helwan	57.5	284	23 0	?	(19 0)	+67	—	—
Budapest	58.8	310	—	—	—	—	e 31.6	—
Vienna	60.2	312	i 10 15	+ 2	18 2	-24	e 28.0	32.1
Hamburg	61.6	319	e 10 24	+ 1	—	—	e 30.0	37.0
De Bilt	64.9	318	—	—	19 25	+ 1	e 33.0	41.0
Strasbourg	65.2	314	—	—	—	—	e 33.0	39.0
Rocca di Papa	65.4	306	i 10 46	- 1	—	—	—	11.5
Edinburgh	67.1	324	—	—	—	—	e 33.0	37.0
Paris	68.0	316	11 7	+ 3	—	—	34.0	42.0
Oxford	68.5	320	—	—	20 7	- 1	36.1	43.7
La Paz	157.3	333	20 10	[+ 5]	—	—	—	—

Additional readings: Zi-ka-wei MN = $+12.6m$. Osaka MN = $+16.8m$.

De Bilt MN = $+36.4m$. Rocca di Papa iPN = $+10m.52s$.

April 12d. Readings also at 0h. (Helwan), 4h. (La Paz), 5h. (Batavia), 8h. (Oxford), 14h. (near Mizusawa), 17h. and 21h. (La Paz), 23h. (De Bilt).

April 13d. 4h. 54m. 5s. Epicentre $37^{\circ}5'N$. $32^{\circ}5'E$. (as on 1914 Oct. 3d.).

A = $+669$, B = $+426$, C = $+609$; D = $+537$, E = -843 ;

G = $+513$, H = $+327$, K = -793 .

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	E. 6.9	276	e 1 39	- 6	i 2 51	-16	—	3.3
	N. 6.9	276	e 1 37	- 8	i 2 55	-12	3.0	4.0
Helwan	7.7	188	4 55	?L	—	—	(4.9)	—
Rocca di Papa	15.8	292	e 3 53	+ 4	—	—	7.9	11.7
Strasbourg	21.1	310	4 57	+ 3	—	—	—	11.9
Uccle	23.9	313	e 5 31	+ 4	e 9 39	- 3	e 12.5	15.9
De Bilt	24.0	316	—	—	9 47	+ 3	12.9	16.2
Oxford	27.6	312	—	—	i 11 55	+63	—	—

No additional readings.

April 13d. Readings also at 3h. and 20h. (La Paz), 21h. (Batavia).

April 14d. Readings at 0h. (Batavia), 1h. (La Paz), 2h. (Rocca di Papa), 3h. (near Mostar), 9h. (La Paz), 16h. (Riverview and Melbourne), 17h. (near Porto Rico), 18h. (Helwan), 22h. (Lick and near Oaxaca).

April 15d. 21h. 6m. 10s. Epicentre $33^{\circ}3'S$. $173^{\circ}7'W$.

$$A = -.831, B = -.092, C = -.549; \quad D = -.110, E = +.994; \\ G = +.546, H = +.060, K = -.836.$$

The evidence of La Paz and Manila (in opposite azimuths and both requiring a more distant epicentre) is in favour of a high focus; and this is supported by San Fernando. But there is scarcely sufficient material to justify a definite solution on these lines.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Wellington	12.2	226	e 3 2	0	i 4 20	-64	—	4.8
Riverview	29.2	259	e 6 22	+ 2	e 11 23	+ 3	e 13.4	16.0
Sydney	29.2	259	6 20	0	(11 38)	+18	11.6	12.4
Melbourne	33.7	250	e 6 56	- 6	—	—	—	13.6
Batavia	77.8	271	i 12 36	+30	i 22 55	+57	—	—
Manila	78.5	296	12 50	+40	(22 48)	+42	22.8	—
La Paz	93.4	112	e 15 9	+95	i 25 23	+34	40.3	—
Helwan	158.5	268	34 50	?	—	—	—	—
De Bilt	161.2	2	e 45 50	?	—	—	—	—
Coimbra	166.3	55	—	—	e 33 50	?	e 47.7	—
Algiers	175.5	36	—	—	e 27 0	?	51.3	—

Additional readings: Riverview iP = +6m.26s., iPR₁ = +7m.11s. and +7m.13s.
PS = +11m.36s., MN = +14.7m. HelwanPN = +43m.50s. Coimbra
eE = +39m.20s. Algiers ? = +28m.2s.

April 15d. Readings also at 19h. (Helwan).

April 16d. Readings at 0h. (Lick), 6h. and 7h. (La Paz), 16h. (Budapest), 17h. (La Paz).

April 17d. Readings at 13h. and 14h. (La Paz), 15h. (Manila), 16h. (La Paz, near Oaxaca, and near Tokyo), 22h. (De Bilt, Capetown, Helwan, Coimbra, Kodaikanal, and Colombo), 23h. (Eskdalemuir).

April 18d. 17h. 59m. 0s. Epicentre $32^{\circ}7'N$. $131^{\circ}9'E$. (as in the Tokyo Bulletin).

$$A = -.562, B = +.626, C = +.540.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Hukuoka	1.5	0 21	- 2	—	—	0.7	0.9
Kagosima	1.6	0 18	- 6	—	—	0.6	1.5
Nagasaki	1.7	0 9	-17	—	—	0.4	0.7
Kobe E.	3.3	1 3	+11	1 24	- 7	1.7	1.8
N.	3.3	1 3	+11	1 27	- 4	1.8	1.8
Osaka	3.5	1 3	+ 8	—	—	1.8	2.4
Tokyo	7.1	1 50	+ 2	2 16	-57	2.4	2.8
Zi-ka-wei	9.0	e 3 8	+52	—	—	—	—
Mizusawa E.	9.8	4 42	?S	(4 42)	+19	5.1	—

Osaka gives also MN = +2.2m. Mizusawa reading is increased by 1h.

April 18d. Readings also at 3h. (near Batavia), 7h. (La Paz), 13h. (near Algiers), 18h. (near Athens), 22h. (Florence), 23h. (Lick).

April 19d. Readings at 0h. (Eskdalemuir, De Bilt, Taihoku, Tokyo, Zi-ka-wei, Mizusawa, Hamburg, Uccle, and Helwan), 11h. (near Mizusawa).

April 20d. 16h. 4m. 10s. Epicentre $35^{\circ}2'N$. $33^{\circ}3'E$.

A = +.683, B = +.449, C = +.576; D = +.549, E = -.836;

G = +.482, H = +.316, K = -.817.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Helwan	E.	5.6	196	1 14	-13	—	—	—	6.6
	N.	5.6	196	1 38	+11	—	—	—	7.4
Pompeii		15.8	296	4 2	+13	7 10	+ 20	—	—
Lemberg		16.1	338	e 1 20	?	—	—	—	1.8
Rocca di Papa	E.	17.4	298	14 14	+ 4	—	—	—	4.5
Vienna		18.1	321	14 25	+ 7	—	—	—	8.2
Padova		19.2	308	4 19	-12	8 10	+ 4	—	—
Moncalieri		21.8	304	e 5 6	+ 3	9 0	- 1	15.5	—
Strasbourg		23.1	313	e 5 10	- 8	9 32	+ 5	10.8	—
Besançon		23.6	309	5 27	+ 3	10 50	+74	—	—
Algiers		24.4	283	5 37	+ 5	10 53	+61	—	16.8
Hamburg		24.6	326	e 5 38	+ 4	e 9 56	+ 1	e 15.8	19.1
Uccle		26.1	316	e 5 44	- 5	e 10 19	- 5	e 12.8	—
De Bilt		26.2	319	—	—	e 10 21	- 5	—	—
Paris		26.4	312	e 5 55	+ 3	e 10 32	+ 2	15.8	19.8
Kew		29.0	315	—	—	—	—	—	18.8
Eskdalemuir		32.1	320	—	—	11 50	-20	—	—

Additional readings and notes: Pompeii P has been increased by 8m. Lemberg gives also e = +1m.44s. There appears to be an error somewhere. Rocca di Papa MN = +5.0m. Vienna iPZ = 16h.1m.47s. Padova PR₁ = +6m.52s., SR₁ = +9m.50s. Paris eSN = +10m.21s., MN = +16.8m. Moncalieri and Kew give their readings as at 15h. and have been corrected by +1h. before entering in the table.

April 20d. 18h. 46m. 3s. Epicentre $32^{\circ}5'N$. $48^{\circ}0'W$.

A = +.564, B = -.627, C = +.537; D = -.743, E = -.669;

G = +.360, H = -.399, K = -.843.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Georgetown		24.3	293	—	—	—	—	14.0	—
Ottawa		24.9	309	e 6 27	+50	—	—	e 15.0	—
Toronto		26.9	303	—	—	—	—	14.6	20.0
Ann Arbor		29.7	299	—	—	—	—	19.8	—
Coimbra		32.5	65	e 4 57	-116	e 11 52	-24	14.6	—
Chicago		32.6	297	e 6 57	+ 4	—	—	18.4	—
Eskdalemuir		38.5	41	—	—	13 57	+12	—	—
Edinburgh		38.7	41	—	—	—	—	—	22.0
Oxford		38.8	47	—	—	13 31	-18	18.2	21.4
Paris		40.8	51	—	—	e 14 14	- 4	20.0	21.0
Uccle		42.1	48	e 8 9	- 3	e 14 32	- 4	e 18.0	22.0
De Bilt		42.7	46	—	—	14 49	+ 5	e 20.0	21.6
Strasbourg		44.2	52	e 8 32	+ 5	—	—	18.0	22.0
Moncalieri		44.3	58	e 8 8	-20	14 57	- 9	21.2	—
Hamburg		45.8	45	e 8 45	+ 6	—	—	e 23.0	27.0
Rocca di Papa		48.3	60	—	—	i 15 49	- 9	—	16.6
La Paz		52.6	205	9 24	0	—	—	25.4	29.6
Victoria		57.1	310	—	—	—	—	33.2	36.2
Helwan		66.3	70	29 57	?L	—	—	(30.0)	—
Taihoku		121.6	11	—	—	e 42 52	?	—	—

Additional readings: Toronto gives also eL = +18.0m. +19.0m. Helwan PN = +37m.57s.

De Bilt eLN =

April 20d. Readings also at 0h. (Kobe), 6h. (Vienna), 9h. (Mizusawa), 15h. (near Mizusawa), 16h. (Manila, Strasbourg, and near Mizusawa), 17h. (La Paz), 19h. (La Paz and near Mizusawa).

April 21d. Readings at 1h. (Algiers), 8h. (Manila), 11h. (Taihoku (2) and Zi-ka-wei), 12h. (Zi-ka-wei and Taihoku), 13h. (Taihoku), 14h. (La Paz), 16h. (Manila), 17h. (Rio Tinto), 18h. (near Athens).

April 22d. 6h. 21m. 36s. Epicentre $30^{\circ}2'S$. $177^{\circ}7'W$. (as on 1921 Mar. 24d.).

A = -·864, B = -·035, C = -·503; D = -·040, E = +·999;

G = +·503, H = +·020, K = -·864.

The epicentric stations would be suited rather better by the solution $T_0 = 6h.21m.0s.$, epicentre $35^{\circ}2'S$. $174^{\circ}3'W$., which was fully worked out. But this gives large positive (P) residuals for the European stations.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Wellington	12·7	206	2 12	-57	(i 5 12)	-25	5·2	6·4
Apia	17·2	20	4 23	+16	8 20	+58	—	13·7
Sydney	26·6	254	5 36	-18	10 24	-9	12·7	14·9
Riverview	26·6	254	e 5 33	-21	10 30	-3	e 12·8	16·2
Melbourne	31·7	246	5 24	-80	11 42	-21	16·1	18·8
Adelaide	36·9	256	e 6 24	-65	e 13 0	-22	e 16·6	22·6
Honolulu	54·9	22	—	—	—	—	25·1	28·0
Manila	74·1	298	e 11 38	-5	—	—	—	—
Batavia	74·3	272	—	—	e 14 17	?PR ₁	e 41·4	47·4
Berkeley	85·4	41	—	—	—	—	e 42·4	—
Victoria	92·4	33	—	—	—	—	e 45·3	48·8
La Paz	97·7	114	e 13 47	-11	i 24 18	-75	47·8	54·0
Colombo	104·3	270	44 24	?	—	—	63·4	67·4
Chicago	109·6	53	50 24	?L	—	—	e 59·4	—
Cape Town	114·1	195	64 57	?L	—	—	(65·0)	—
Toronto	115·9	53	—	—	—	—	e 64·3	66·1
Ottawa	118·9	52	—	—	—	—	e 64·2	—
Edinburgh	154·0	7	—	—	—	—	84·4?	88·4
Lemberg	154·4	326	e 19 12	[-49]	—	—	—	24·8
Eskdalemuir	154·6	7	e 25 1	?PR ₁	e 44 51	?SR ₁	81·8	—
Helwan	154·9	275	30 24	?S	—	—	—	—
Stonyhurst	156·0	7	e 36 6	?	44 30	?	89·5	98·4
Hamburg	156·2	349	e 20 24	[+21]	—	—	e 83·4	111·4
De Bilt	158·0	353	24 18	?PR ₁	—	—	e 85·4	97·0
Oxford	158·2	6	—	—	—	—	—	90·4
Budapest	158·5	328	e 39 24	?	—	—	e 92·4	109·4
Kew	158·6	5	103 24	?	—	—	—	126·4
Vienna	159·1	333	e 20 12	[+5]	—	—	e 82·4	102·4
Strasbourg	161·2	349	—	—	—	—	92·4	—
Paris	161·4	0	e 20 10	[+2]	—	—	88·4	92·4
Moncalieri	164·8	345	20 22	[+10]	33 14	?	45·6	114·2
Rocca di Papa	165·7	327	e 22 12	?	—	—	—	40·8
Coimbra	166·7	38	—	—	e 40 24	?	e 84·4	—
Tortosa	169·3	5	22 24	?	32 24	?	—	—
Rio Tinto	169·4	42	87 24	? L	—	—	(87·4)	105·4
San Fernando N.	170·5	46	—	—	—	—	94·4	108·4
Algiers	173·4	358	—	—	e 33 0	?	47·5	103·1

Additional readings: Wellington gives also $e = +3m.12s.$ and $+4m.54s.$
 Apia MN = +14·9m., $T_0 = 6h.21m.22s.$ Epicentre $16^{\circ}0'S$. $167^{\circ}0'E$. Riverview $eP = +7m.14s.$, S is given as PS, $eS = +10m.10s.$, MN = +14·2m., MZ = +15·2m. Adelaide i = +14m.6s. and +15m.24s., e = +20m. Melbourne $SR_1 = +13m.54s.$, $SR_2 = +14m.42s.$ Honolulu $eLN = +30·0m.$ Batavia $eL = +59·4m.$ Toronto $eL = +71·9m.$, L = +77·6m. Ottawa $LE = +78·4m.$ Helwan PN = +36m.24s. De Bilt $eE = +39m.1s.$ and +44m.31s., MN = +95·6m. Coimbra $e = +46m.24s.$, $eLN = +88·4m.$ Rocca di Papa $ePN = +21m.24s.$, $ePE = +22m.0s.$ Algiers MN = +105·1m.

April 22d. 16h. 3m. 45s. Epicentre $43^{\circ}0'N$. $17^{\circ}0'W$.

A = +.699, B = -.214, C = +.682; D = -.292, E = -.956;
G = +.652, H = -.199, K = -.731.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Coimbra	7.0	110	i 1 55	+ 9	i 3 4	- 6	4.5	5.0
San Fernando	10.6	125	1 21	?	—	—	—	6.8
Granada	10.8	115	3 0	+ 4	5 1	-13	—	—
Tortosa	13.2	94	3 12	- 4	5 16	-33	6.2	7.2
Oxford	13.7	45	i 3 20	- 2	5 55	- 6	6.2	9.4
Kew	14.1	47	—	—	—	—	—	11.2
Barcelona	14.2	90	3 36	+ 7	5 59	-14	6.4	8.3
Paris	14.7	60	e 3 35	0	e 6 0	-25	7.2	7.2
Eskdalemuir	15.2	31	—	—	—	—	7.2	—
Edinburgh	15.6	30	—	—	—	—	—	8.8
Uccle	16.5	54	e 3 58	- 1	e 7 3	- 4	e 7.8	8.2
Algiers	16.6	105	4 4	+ 4	7 16	+ 7	8.9	10.4
Besançon	16.7	68	5 15?	+74	—	—	—	—
De Bilt	E. N.	17.4 51	4 11	+ 1	7 33	+ 6	8.4	10.6
Moncalieri	17.8	75	e 3 49	-26	7 19	-17	9.5	—
Strasbourg	18.0	64	4 21	+ 4	e 7 43	+ 3	8.2	—
Hamburg	20.7	50	e 4 48	- 1	e 8 42	+ 4	e 10.6	12.2
Rocca di Papa	21.9	83	15 4	0	—	—	—	17.0
Vienna	23.7	66	i 5 22	- 3	14 15	?L	(14.2)	—
Helwan	40.4	93	20 15	? L	—	—	(20.2)	—

Additional readings and notes: Coimbra gives also MN = +3.2m., MN = -4.8m. Tortosa readings are given as at 10h. Barcelona LN = +7.4m. Rocca di Papa eSE = +14m.53s. and +17m.1s., iSN = +15m.2s. and +16m.57s. Vienna L = +70.2m. Helwan PN = +17m.15s.

April 22d. 20h. 47m. 0s. Epicentre $30^{\circ}2'S$. $177^{\circ}7'W$. (as at 6h.).

The elements originally adopted were 22d. 20h. 46m. 35s.; and epicentre $35^{\circ}2'S$. $174^{\circ}3'W$. See the corresponding note for the 6h. shock. But this gave for Vienna the large positive residual [+23s.], and it seemed better to follow the solution finally adopted for 6h.

A = -.864, B = -.035, C = -.503; D = -.040, E = +.999;
G = +.503, H = +.020, K = -.864.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Wellington	12.7	206	e 3 42	+33	—	—	6.9	8.0
Sydney	26.6	254	7 30	+96	—	—	14.6	17.4
Riverview	26.6	254	e 5 46	- 8	11 2	+29	12.9	15.1
Melbourne	31.7	246	6 36	- 8	11 42	-21	15.4	19.0
Manila	74.1	298	e 11 0	-43	—	—	—	—
Helwan	154.9	275	42 0	?SR ₁	—	—	(86.0)	—
Hamburg	156.2	349	—	—	—	—	85.0	—
De Bilt	158.0	353	—	—	e 44 24	?	e 79.0	99.3
Vienna	159.1	333	20 10	[+ 3]	—	—	—	—
Uccle	159.3	355	—	—	—	—	e 78.0	—

Additional readings: Wellington gives also e = +6m.18s., i = +12m.6s. Riverview MN = +17.4m., MZ = +19.7m. Helwan PN = +96m.0s. The SR₁ entered above is given as P of a later shock.

April 22d. Readings also at 8h. and 9h. (La Paz), 10h. (Tortosa), 14h. (Florence), 16h. (near Tacubaya and Oaxaca), 22h. (Melbourne and Uccle).

April 23d. Readings at 6h. (Batavia), 9h. (Rocca di Papa), 18h. (La Paz), 19h. (near Riverview and Adelaide), 20h. (Melbourne and Riverview), 21h. (Strasbourg, Vienna, Riverview, and Melbourne), 22h. (Helwan), 23h. (Manila).

April 24d. Readings at 1h. (near Mostar and Sarajevo), 12h. (near Tokyo), 16h. (near Osaka and near Tacubaya), 18h. (near Taihoku), 22h. (Manila), 23h. (Melbourne).

April 25d. 17h. 33m. 43s. Epicentre 22° -0S. 180° -0 (as on 1920 Sept. 8d.).

A = -0.927, B = 0.000, C = -0.375; D = 0.000, E = +1.000;
G = +0.375, H = 0.000, K = -0.927.

A depth 0.040 of focus is assumed (see Note to 1917 May 24d.).

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia		-0.6	11.3	45	e 2 29	-11	—	—	5.9	6.8
Wellington		-1.6	19.8	191	e 4 47	+28	—	—	e 9.1	11.1
Christchurch		-1.9	22.4	194	—	—	9 53	+79	11.0	17.7
Riverview		-2.4	28.0	239	e 5 44	0	e 10 14	0	e 12.1	13.4
Sydney		-2.4	28.0	239	7 35	? PR ₁	11 29	? SR ₁	13.0	16.3
Melbourne		-2.9	34.0	234	7 53	? PR ₁	11 41	-12	14.1	20.6
Adelaide		-3.2	38.3	240	e 7 59	+45	i 12 53	-4	e 16.9	23.6
Honolulu	E.	-3.9	48.4	28	—	—	—	—	18.3	21.6
	N.	-3.9	48.4	28	—	—	—	—	18.6	24.4
Perth		-4.5	57.2	245	17 28	? S	(17 28)	+36	29.5	—
Manila		-4.8	68.5	297	e 11 1	+25	—	—	—	—
Batavia		-4.9	72.1	270	e 10 51	-8	e 20 3	+11	e 31.3	—
Berkeley		-5.1	80.7	42	—	—	—	—	e 36.3	—
Victoria		-5.3	86.7	34	—	—	—	—	e 35.2	42.7
La Paz		-5.6	102.9	114	e 18 31	? PR ₁	—	—	—	—
Kodaikanal		-5.7	105.3	275	61 11	?	—	—	64.0	70.7
Chicago		-5.7	106.2	51	36 52	? SR ₁	—	—	52.3	—
Ann Arbor	E.	-5.8	109.1	51	—	—	—	—	73.4	—
Toronto		-5.9	112.5	50	—	—	—	—	59.9	64.1
Ottawa		-6.0	115.4	49	—	—	—	—	e 56.8	—
Cape Town		—	121.4	199	50 55	? L	—	—	(50.9)	—
Edinburgh		—	146.0	3	—	—	—	—	73.3	94.3
Eskdalemuir		—	146.6	4	23 17	? PR ₁	—	—	—	—
Hamburg		—	147.5	350	e 19 31	[-21]	—	—	e 69.3	74.3
Stonyhurst		—	148.1	3	71 17	? L	—	—	(71.3)	93.0
De Bilt		—	149.7	354	19 35	[-20]	—	—	e 68.3	83.0
Budapest		—	150.3	334	e 57 17	?	—	—	e 72.3	—
Oxford		—	150.3	2	—	—	—	—	70.4	89.9
Vienna		—	150.7	337	i 19 25	[-32]	—	—	e 70.3	86.3
Helwan		—	150.9	292	30 17	? S	—	—	—	—
Uccle		—	151.0	353	e 19 26	[-31]	—	—	e 67.3	84.3
Belgrade		—	151.7	328	e 19 16	[-42]	e 19 49	?	69.1	—
Strasbourg		—	152.8	349	e 19 31	[-29]	—	—	e 75.3	78.3
Paris		—	153.2	356	e 19 33	[-27]	e 36 18	?	73.3	86.3
Padova		—	154.7	340	19 31	[-31]	20 3	?	—	—
Moncalieri		—	156.2	346	e 19 51	[-12]	36 25	?	75.8	—
Rocca di Papa		—	157.6	335	e 19 45	[-21]	—	—	e 79.8	—
Pompeii	E.	—	157.6	330	20 30	[+24]	—	—	—	—
Coimbra		—	160.5	19	—	—	—	—	e 74.3	—

Additional readings and notes: Wellington gives also eP = +1m.53s. Christchurch SR₁ = +10m.17s. All readings for this Observatory are given for 18h. and have been corrected. Riverview iS = +10m.19s., SR₂ = +11m.46s., SR₃ = +11m.58s., MZ = +14.7m. Adelaide i = +15m.47s. and +19m.53s. Perth S = +23m.40s. (?SR). Ann Arbor LN = +73.1m. Toronto eL = +62.6m. and +73.6m. Stonyhurst +80m.5s. and +91m.17s. De Bilt MN = +76.8m. Helwan PN = +36m.17s. Padova SR₁ = +20m.49s. Rocca di Papa eE = +19m.47s. iPM = +19m.59s. Belgrade ePN = +18m.12s.

April 25d. Readings also at 2h. (Riverview), 7h. (near Kobe, Osaka, Nagasaki, Iukuoka, and Mizusawa), 14h. (near Tacubaya), 23h. (near Athens).

April 26d. Readings at 2h. (Uccle), 4h. (Taihoku), 11h. (near Taihoku), 14h. (Helwan), 15h. and 19h. (La Paz),

April 27d. 2h. 5m. 16s. Epicentre $0^{\circ}48'. 20^{\circ}0'W$. (as on 1918 June 3d.).

$$A = +.940, B = -.342, C = -.007; \quad D = -.342, E = -.940; \\ G = -.007, H = +.002, K = -1.000.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Algiers	42.5	27	e 8 15	0	—	—	22.7	38.2
La Paz	50.1	249	e 9 8	0	e 16 18	- 2	23.7	25.2
Paris	52.9	18	e 11 44	?PR ₁	—	—	25.7	34.7
De Bilt	E. 56.6	18	—	—	18 2	+21	e 24.7	31.3
	N. 56.6	18	—	—	—	—	e 25.7	38.2
Helwan	57.4	53	18 44	?S	(18 44)	+53	(26.7)	—
Edinburgh	57.9	11	—	—	—	—	—	29.7

Additional notes: Algiers gives also ? = +9m.57s., all readings given as at 3h.
La Paz iP = +9m.18s., T₀ = 2h.5m. 23s.

April 27d. Readings also at 1h. (Melbourne, Wellington, and Riverview), 2h. (Strasbourg), 6h. (La Paz), 9h. (Kodaikanal and near Calcutta), 10h. (De Bilt, Eskdalemuir, Helwan, and Hamburg), 12h. (near Osaka), 13h. (near Tokyo), 17h. (Zurich), 18h. (near Nagasaki), 21h. (La Paz, Ottawa, and San Fernando), 22h. (near Rocca di Papa and Pompeii).

April 28d. Readings at 2h. (La Paz), 3h. (Lick), 4h. (La Paz), 10h. (Paris, Hamburg, Helwan, Osaka, Budapest, Rocca di Papa, Uccle, and De Bilt), 16h. (La Paz and Manila), 19h. (Manila), 20h. (Helwan, La Paz, and De Bilt), 21h. (San Fernando).

April 29d. Readings at 19h. (near Osaka), 22h. (Zurich), 23h. (San Fernando).

April 30d. Readings at 2h. (La Paz and near Athens), 6h. (near Tokyo), 14h. (San Fernando), 15h. (near Zurich and Chur), 17h. (near Zurich).

1921. May 1d. 5h. 38m. 56s. Epicentre $18^{\circ}5'N. 104^{\circ}5'W$.
(suggested by Ottawa).

$$A = -.237, B = -.918, C = +.317; \quad D = -.968, E = +.250; \\ G = -.079, H = -.307, K = -.948.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mazatlan	5.1	340	4 44	?	—	—	5.8	6.4
Tacubaya	E. 5.1	80	1 28	+ 9	—	—	2.6	2.7
	Z. 5.1	80	1 26	+ 7	—	—	2.5	3.0
Oaxaca	7.5	100	2 55	+61	—	—	4.6	5.0
Tucson	E. 14.9	338	3 42	+ 4	6 30	0	7.2	8.4
	N. 14.9	338	—	—	e 6 51	+21	e 8.2	9.6
St. Louis	E. 23.6	29	e 5 19	- 5	9 40	+ 4	11.0	15.1
	N. 23.6	29	—	—	9 34	- 2	—	14.9
Lick	E. 24.1	325	e 5 27	- 2	e 10 3	+17	e 11.8	—
	N. 24.1	325	e 5 27	- 2	e 10 5	+19	e 11.7	—
Berkeley	E. 24.9	325	e 5 39	+ 2	e 10 24	+23	e 12.2	16.1
Balboa Heights	E. 26.0	108	7 4	?	—	—	—	—
Chicago	27.3	28	5 50	-11	10 42	- 4	13.7	17.2
Ann Arbor	E. 29.6	32	6 28	+4	11 52	+25	18.1	19.0
	N. 29.6	32	6 4	-20	—	—	18.0	19.0
	E. 29.6	32	6 16	- 8	—	—	18.5	—
	N. 29.6	32	5 52	-32	—	—	18.0	—
Cheltenham	E. 31.3	46	7 23	+42	e 18 14	?	e 20.9	21.4
	N. 31.3	46	—	—	—	—	17.9	20.4
Georgetown	E. 31.3	45	7 22	+41	11 54	- 2	e 20.1	21.1
	N. 31.3	45	7 22	+41	11 52	- 4	e 20.1	22.2
Washington	31.3	45	6 58	+17	11 46	-10	14.4	—
Toronto	32.8	35	—	—	12 52	+31	i 20.9	27.9

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Saskatoon	N.	33.5	1	6 43	-18	12 15	-17	15.6	—
Victoria	Z.	33.6	339	(7 38)	+37	(12 4)	-30	12.1	19.0
		33.6	339	6 49	-12	—	—	—	22.3
Ithaca		33.7	39	e 7 19	+17	e 11 46	-50	e 17.6	—
Ottawa		35.9	37	7 4	-17	12 50	-19	e 17.3	22.6
Northfield		37.0	39	e 8 34	+64	13 4	-20	e 15.2	—
Halifax	N.	42.9	43	e 8 4	-13	e 14 14	-33	e 21.1	—
Sitka	N.	44.9	338	—	—	—	—	e 25.7	—
La Paz		50.0	133	9 7	0	16 24	+ 5	23.2	29.9
Honolulu	N.	50.2	282	—	—	16 29	+ 8	23.6	25.2
Edinburgh		80.9	34	12 23	- 1	22 36	+ 2	43.1	49.8
Eskdalemuir		81.0	34	i 12 28	+ 3	22 49	+14	39.1	43.2
Stonyhurst		82.0	37	12 34	+ 4	23 28	-18	47.1	49.6
Coimbra		82.6	50	i 12 35	+ 1	23 9	+16	e 37.1	56.2
West Bromwich		82.7	38	12 35	+ 1	23 5	+11	—	—
Oxford		83.4	39	i 12 44	+ 6	23 4	+ 3	40.4	50.3
Kew		84.1	39	23 4	?S	(23 4)	- 5	—	50.1
San Fernando		85.5	52	11 46	-65	22 16	-69	—	53.2
Paris		86.8	40	i 12 56	- 2	e 23 22	-17	49.1	51.1
De Bilt		86.9	35	13 1	+ 3	23 32	- 8	e 51.1	—
Uccle		87.0	37	e 12 54	- 5	e 23 30	-11	e 42.1	52.1
Granada		87.1	31	i 13 1	+ 1	23 35	- 7	—	—
Hamburg		88.7	33	e 13 2	- 7	e 23 36	-24	e 46.1	58.9
Tortosa		88.8	47	13 3	- 6	23 33	-28	37.8	67.6
Barcelona	E.	89.6	45	e 13 3	-11	e 23 37	-33	e 48.8	57.5
	N.	89.6	45	—	—	—	—	e 44.7	54.8
Besançon		89.6	40	—	—	23 46?	-24	52.1	—
Strasbourg		90.0	38	e 13 8	- 8	23 30	-44	e 40.1	54.8
Moncalieri		91.7	41	e 13 15	-10	21 18	-194	39.1	56.9
Algiers		92.3	49	e 13 18	-11	23 53	-45	42.1	56.1
Vienna		95.0	35	i 13 33	-10	24 13	-53	e 48.0	56.1
Pola		95.4	38	—	—	e 23 40	-90	e 53.7	57.7
Wellington		95.4	229	—	—	e 24 4	-66	44.3	47.1
Rocca di Papa		96.4	42	i 13 42	- 9	i 24 22	-58	e 54.1	61.2
Budapest		96.9	34	—	—	e 23 58	-87	e 45.4	56.1
Pompeii	E.	98.1	42	17 4	?PR ₁	—	—	59.1	—
Riverview		111.8	240	—	—	e 28 58	+74	e 52.5	62.1
Zi-ka-wei		113.6	319	—	—	—	—	e 64.4	—
Helwan		115.6	41	20 4	?PR ₁	—	—	—	—
Melbourne		117.3	236	—	—	29 58	+90	53.0	66.2
Adelaide		122.2	240	—	—	—	—	e 64.8	76.1
Manila		124.3	304	—	—	—	—	e 81.1	89.1
Cape Town		127.2	119	—	—	—	—	—	77.1
Simla		130.4	359	—	—	—	—	e 59.3	—
Kodaikanal		151.2	356	e 13 58	?L	—	—	88.2	92.0
Colombo		154.3	350	95 4	?L	—	—	(95.1)	99.1

Additional readings: Berkeley gives also MN = +17.1m. Georgetown
 SR₁ = +17m.48s. Toronto PR₁ = +8m.16s., eL = +23.9m., +62.1m.,
 and +64.1m. Saskatoon PR₁N = +7m.48s., T₀ = 5h.38m.40s. Ithaca
 LE = +21.2m. Ottawa PR₂ = +8m.22s., MN = +19.9m., T₀ = 5h.38m.43s.,
 epicentre 18° 5'N. 104° 5'W., as adopted. Halifax SR₁N = +17m.29s.,
 T₀ = 5h.38m.43s. La Paz iPN = +9m.13s., T₀ = 5h.38m.54s., epicentre
 20° 5'N. 102° 0'W. Honolulu SR₁N = +20m.28s., SR₂N = +21m.36s.,
 Eskdalemuir MN = +48.4m. Uccle SR₁ = +29m.34s., SR₂ = +33m.22s.
 Hamburg MN = +53.5m., MZ = +60.1m. Strasbourg MN = +54.1m.
 Moncalieri MN = +55.1m. Vienna MZ = +56.8m. Pola MN =
 +56.9m. Wellington e = +29m.4s. and +37m.4s. Riverview MN =
 +59.4m. Melbourne PR₂ = +25m.4s., SR₁ = +36m.40s., PR₂ corrected
 by -40m.

May 1d. Readings also at 0h. (Taihoku and Manila), 1h. (near Zurich and Chur),
 3h. (Florence, Manila, Zi-ka-wei, and near Taihoku), 4h. (De Bilt), 7h.
 (La Paz), 9h. (Taihoku), 11h. (Taihoku and Manila), 12h. (Fordham),
 14h. (Batavia), 16h. and 17h. (2) (Belgrade), 18h. (near Tokyo), 19h.
 (Manila and near Batavia (3)), 20h. (near Vera Cruz), 21h. (La Paz,
 Tacubaya, and near Puebla), 23h. (Melbourne).

May 2d. Readings at 7h. (Manila, Taihoku, and Florence), 13h. (La Paz), 16h.
 (Riverview and Wellington), 19h. (Helwan), 20h. (Belgrade), 21h. (near
 Oaxaca), 23h. (Mizusawa).

May 3d. 8h. 23m. 12s. Epicentre $43^{\circ}5'N$. $7^{\circ}5'E$. (as on 1919 Nov. 28d.).

$$A = +.719, B = +.095, C = +.688.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Marseilles	1.6	0 35	+11	0 56	+11	—	—
Besançon	3.9	(1 20)	+19	1 20	-27	—	—
Zurich	3.9	e 0 55	- 6	i 1 35	-12	—	1.8
Strasbourg	5.1	e 1 17	- 2	e 2 12	- 8	e 2.6	—
Paris	6.4	e 1 52	+14	e 2 51	- 4	—	—

Zurich gives $iSZ = +1m.36s$.

May 3d. 10h. 42m. 50s. Epicentre $15^{\circ}0'S$. $172^{\circ}0'W$. (suggested by Apia).

$$A = -.956, B = -.134, C = -.259; \quad D = -.139, E = +.990;$$

$$G = +.256, H = +.036, K = -.966.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	1.2	11	0 20	+ 2	(0 38)	+ 5	0.6	—
Riverview	38.1	234	e 8 22	+43	—	—	e 15.8	20.3
Honolulu	38.8	21	—	—	—	—	17.8	18.3
Melbourne	44.2	230	—	—	e 14 22	-43	—	24.5
La Paz	98.6	109	—	—	—	—	48.8	—
Eskdalemuir	138.8	10	—	—	—	—	68.2	—
De Bilt	142.9	3	—	—	—	e 77.2	—	—
Vienna	146.1	349	19 22	[-28]	—	—	—	—
Paris	146.2	6	e 19 25	[-25]	—	—	78.2	78.2
Strasbourg	146.5	0	e 19 24	[-26]	—	—	—	—
Helwan	153.9	309	97 10	?L	—	—	(97.2)	—

Additional readings and notes: Apia reading given as on 1d. Riverview gives also $MN = +20.6m$. Honolulu $LN = +17.5m$, $MN = +19.0m$. Eskdalemuir reading has been increased by 1h. De Bilt $eLN = +72.2m$. Helwan $PN = +93m.10s$.

May 3d. Readings also at 1h. (Moncalieri), 4h. (2), 5h., and 6h. (La Paz), 8h. (Capetown), 15h. (Belgrade), 17h. (Cape Town), 19h. (La Paz).

May 4d. 4h. 53m. 30s. Epicentre $45^{\circ}0'N$. $135^{\circ}0'E$. (as on 1919 May 16d.).

$$A = -.500, B = +.500, C = +.707; \quad D = +.707, E = +.707;$$

$$G = -.500, H = +.500, K = -.707.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	10.0	157	e 14 20	?	—	—	—	—
Zi-ka-wei	17.4	222	e 4 10	0	e 7 26	- 1	—	—
Taihoku	22.7	213	—	—	e 9 55	+36	—	—
Manila	32.6	207	—	—	e 11 14	-64	—	—
Batavia	57.1	214	—	—	—	—	e 25.6	—
Hamburg	70.9	329	—	—	—	—	e 33.5	—
Eskdalemuir	73.7	338	—	—	—	—	37.5	—
De Bilt	73.8	330	—	—	—	—	e 36.5	—
Uccle	75.1	330	—	—	—	—	e 35.5	—
Strasbourg	75.8	328	—	—	—	—	e 36.5	—
Kew	76.1	335	—	—	—	—	—	44.5
Oxford	76.2	335	—	—	—	—	—	45.6
Paris	77.4	330	—	—	—	—	e 38.5	47.5
Helwan	78.0	301	37 30	?L	(25 30)	?SR ₁	(37.5)	—

Helwan readings are given as PE and PN respectively.

May 4d. 17h. 35m. 48s. Epicentre $48^{\circ}0'N$. $18^{\circ}0'E$.

A = +.636, B = +.207, C = +.743; D = +.309, E = -.951;
G = +.707, H = +.230, K = -.669.

Very doubtful. The material is not at all good.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Budapest	0.9	126	i 0 14	0	—	—	e 1.1	—
Vienna	1.1	283	i 0 10	-7	—	—	i 0.4	2.8
Belgrade	3.6	150	e 0 45	-11	1 47	+ 8	(1.8)	3.2
Pola	4.3	224	e 1 4	-3	(e 2 0)	+ 2	e 2.0	2.5
Lemberg	4.4	63	—	—	—	—	e 2.2	2.8
Padova	5.0	240	1 55	+38	3 28	?L	(3.5)	3.6
Zurich	6.4	268	e 1 23	-15	3 23	?L	(3.4)	—
Strasbourg	6.8	279	e 2 43	?S	(e 2 43)	-22	e 3.6	5.4
Rocca di Papa	7.3	213	i 4 0	?L	—	—	(i 4.0)	4.6
Hamburg	7.5	321	—	—	e 3 12	-12	e 4.2	5.3
Moncalieri	7.7	250	e 1 32	-25	2 44	-45	4.0	5.4
Besançon	8.2	271	4 14	?L	—	—	(4.2)	6.2
De Bilt	9.2	301	—	—	—	—	e 4.6	6.1
Uccle	9.3	293	—	—	e 4 18	+ 8	e 4.8	—
Paris	10.3	280	—	—	e 5 16	?L	5.9	6.2
Cape Town	81.9	180	—	—	—	—	—	60.2

Additional readings and notes: Budapest readings have been increased by 2m.
Belgrade P = +54s. Vienna gives also iPZ = +0m.5s., ePZ = +0m.4s.,
MN = +0.7m., MZ = +3.2m. Pola MN = +2.4m. Padova PR₁ =
+2m.30s. Strasbourg MN = +4.5m. Rocca di Papa eE = +2m.42s.,
eN = +4m.12s. Hamburg MZ = +5.6m., MN = +6.3m. De Bilt MN =
+5.8m.

May 4d. 21h. 12m. 25s. Epicentre $11^{\circ}0'S$. $176^{\circ}0'W$. (as on 1918 Aug. 1d.).

A = -.979, B = -.068, C = -.191; D = -.070, E = +.997;
G = +.190, H = +.013, K = -.982.

If we accept the Apia observations as exact we must write $\Delta = 3^{\circ}.3$, $T_0 = 21h.13m.7s$. This makes Manila and Batavia, in azimuths nearly opposite to that of Apia, also require a diminished Δ ; thus, agreeing with the revised observations of [P], viz. [-41s.], [-38s.], and [-38s.] in requiring a deep focus. But the evidence is too slight to justify a definite assumption of this kind.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	5.0	125	1 34	+17	(2 13)	-4	2.2	—
Honolulu	E. 36.9	28	e 16 45	?	—	—	16.9	17.9
Riverview	37.7	228	—	—	—	—	e 15.6	17.1
Manila	67.4	291	e 19 11	?S	(e 19 11)	-44	—	—
Batavia	76.2	270	—	—	i 21 27	-12	—	21.9
La Paz	103.6	110	17 11	?	—	—	—	—
De Bilt	138.9	359	—	—	e 42 35	?SR ₁	—	—
Vienna	141.4	347	i 19 43	[+ 1]	—	—	—	21.7
Paris	142.1	2	e 19 47	[+ 4]	—	—	80.9	—
Strasbourg	142.2	356	e 19 47	[+ 4]	e 20 54	?	e 21.0	—
Helwan	N. 148.3	311	103 35	?	—	—	—	—

Additional readings: Honolulu gives also LN = +17.2m. Riverview e?
= +9m.29s. Vienna MZ = +21.0m.

May 4d. Readings also at 16h. (La Paz), 17h. (Helwan and Budapest), 18h. (Vienna, Budapest, and near Athens), 20h. (Helwan).

May 5d. Readings at 3h. (Riverview), 5h. (Batavia), 6h. (Mostar, Sarajevo, and Belgrade), 10h. (Wellington and near Pompeii), 11h. (Helwan and near Pompeii), 18h. (La Paz and near Tokyo), 20h. (Kobe and Helwan).

May 6d. Readings at 2h. (near Algiers), 3h. (Manila), 4h. (Helwan), 7h. and 10h. (La Paz), 14h. (Taihoku and near La Paz), 16h. (Manila).

May 7d. Readings at 2h. (La Paz), 3h. (Helwan), 4h. (near Batavia), 13h. and 22h. (La Paz).

May 8d. Readings at 6h. (La Paz and near Mostar), 11h. (La Paz), 18h. (Manila and near Mizusawa), 21h. (La Paz).

May 9d. Readings at 1h. (near Port au Prince), 4h. (Vienna), 5h. and 9h. (La Paz), 10h. (Apia), 12h. (La Paz), 13h. (Helwan), 16h. (La Paz), 17h. (Helwan), 19h. (Taihoku), 20h. (Manila), 22h. (Manila).

May 10d. 4h. 55m. 50s. Epicentre $41^{\circ}0'N$. $24^{\circ}6'E$. (as on 1919 Oct. 9d.).

$$A = +.686, B = +.314, C = +.656; \quad D = +.416, E = -.909; \\ G = +.596, H = +.273, K = -.755.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	3.2	192	1 0	+10	1 33	+ 5	e 1.6	2.0
Belgrade	4.9	324	e 1 40	+24	—	—	—	4.3
Sarajevo	5.4	305	e 1 29	+ 6	i 2 28	0	—	3.4
Mostar	5.5	297	i 1 26	+ 1	i 2 13	-18	—	3.7
Pompeii	E. 7.6	272	1 34	-21	3 14	-12	—	3.7
Budapest	7.6	331	e 3 45	?L	—	—	(3.8)	—
Pola	8.7	300	e 2 3	- 9	—	—	e 4.7	5.4
Rocca di Papa	E. 9.0	279	i 1 53	-23	4 10	+ 7	—	4.6
	N. 9.0	279	—	—	4 15	+12	—	5.0
Padova	10.2	300	1 58	-35	9 52	?L	(9.9)	—
Florence	10.2	290	5 10	?L	—	—	(5.2)	7.2
Helwan	12.4	152	8 10	?L	—	—	(8.2)	—
Moncalieri	12.9	293	e 2 28	-44	—	—	6.3	—
Zurich	13.1	305	e 3 21	+ 7	—	—	—	—
Strasbourg	14.1	308	e 3 24	- 3	e 8 7	?L	e 10.1	—
Besancon	14.6	302	3 46?	+12	8 31	?L	(8.5)	10.2
Hamburg	16.0	327	e 4 10	+18	—	—	e 9.5	10.2
Uccle	17.1	312	e 4 10	+ 4	e 7 22	+ 2	e 9.8	—
Algiers	17.2	263	e 3 41	-26	6 28	-54	14.2	—
De Bilt	17.3	316	—	—	e 7 38	+13	9.6	11.6
Paris	17.3	304	e 4 8	- 1	e 7 51	+26	9.8	11.2
Tortosa	18.1	278	e 1 10	?	(e 7 10)	-32	e 7.2	12.5
Oxford	20.7	310	—	—	i 8 32	- 6	—	14.6
Eskdalemuir	23.2	318	—	—	e 9 27	- 2	13.2	—
Edinburgh	23.4	319	—	—	9 10	-23	—	—
Coimbra	24.9	279	—	—	(e 9 26)	-35	e 9.4	—

Additional readings: Belgrade gives also $iP = +2m.26s.$, $iSR_1 = +3m.44s.$
 Budapest gives also $e = +5m.3s.$ Pola $MN = +7.1m.$ Rocca di Papa
 $L = +9.0m.$ Padova $PR_1 = +7m.8s.$ Helwan $PN = +13m.10s.$
 Hamburg $MZ = +12.3m.$, $MN = +13.3m.$ De Bilt $MN = +10.8m.$
 Coimbra $e = +8m.24s.$

May 10d. Readings also at 1h. (La Paz (2) and Nagasaki), 2h. and 3h. (Helwan), 4h. (Florence and Lemberg), 8h. (near Algiers), 11h. (Helwan), 12h. (Apia and La Paz), 15h. (near Mizusawa), 18h. (near Vera Cruz, Oaxaca, and Tacubaya), 20h. (La Paz).

May 11d. Readings at 0h. (near Vienna), 1h. (near Pompeii and Rocca di Papa), 3h. (La Paz (3) and Apia), 4h. and 6h. (Manila), 9h. (La Paz), 11h. (near Mizusawa), 12h. (near Tokyo, Mito, Tyosi, and Mizusawa), 14h. (near Rocca di Papa), 16h. (Helwan), 18h. (Helwan, Strasbourg, and near Rocca di Papa).

May 12d. 3h. 40m. 14s. Epicentre $6^{\circ}\cdot5\text{S}$. $153^{\circ}\cdot5\text{E}$. (as on 1918 Jan. 4d.).

$$A = -\cdot889, B = +\cdot443, C = -\cdot113; \quad D = +\cdot446, E = +\cdot895; \\ G = +\cdot101, H = -\cdot051, K = -\cdot994.$$

The antipodal stations suggest an increase of T_0 or a high focus. The latter is contradicted by the observations near the epicentre, which suggest rather a deep focus.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	27.4	184	e 5 54	- 8	e 10 34	-14	e 12.1	15.4
Sydney	27.4	184	10 58	?S	(10 58)	+10	15.2	17.2
Adelaide	31.6	204	e 6 4	-39	i 11 58	- 3	e 14.9	19.6
Apia	34.9	105	—	—	—	—	16.8	—
Manila	38.5	303	e 7 25	-17	—	—	—	21.2
Wellington	39.6	155	7 46	- 5	13 46	-14	18.1	22.8
Perth	43.3	229	8 15	- 5	14 51	- 1	23.9	—
Tokyo	44.1	344	—	—	—	—	e 16.8	—
Taihoku	44.3	317	—	—	e 14 46	-20	—	—
Batavia	46.4	268	e 8 13	-30	i 15 2	-31	e 22.8	—
Zi-ka-wei	48.7	323	e 9 22	+24	—	—	—	—
Honolulu	55.1	58	i 9 31	- 9	i 17 4	-18	25.6	34.2
E. N.	55.1	58	—	—	—	—	25.8	34.6
Kodaikanal	78.2	283	54 4	?	—	—	—	—
Berkeley	89.4	52	—	—	e 23 57	-10	—	—
Victoria	90.5	41	23 12	?	(23 12)	-67	41.7	48.8
Chicago	115.7	45	19 36	?PR ₁	29 24	+68	e 46.3	—
Toronto	120.8	42	—	—	—	—	63.8	75.0
Helwan	121.0	301	20 46	?PR ₁	(28 46)	-11	—	—
Cape Town	121.4	223	32 1	?	—	—	—	63.0
E. N.	122.4	39	19 46	[+47]	e 25 26	-221	50.3	—
Budapest	123.6	325	—	—	—	—	e 48.8	61.8
Hamburg	124.5	335	e 21 46	?PR ₁	—	—	e 56.8	67.8
Vienna	124.7	327	e 19 18	[+13]	—	—	e 63.8	75.3
Edinburgh	127.3	344	—	—	—	—	55.8	—
De Bilt	127.5	336	—	—	e 31 8	+84	e 57.8	60.6
Eskdalemuir	127.8	343	e 21 12	?PR ₁	e 31 2	+76	54.8	70.7
Uccle	128.8	334	e 21 20	?PR ₁	—	—	e 54.8	59.8
Stonyhurst	128.8	342	e 22 16	?PR ₁	—	—	—	85.3
Strasbourg	128.9	330	—	—	—	—	e 68.3	—
Kew	130.1	339	—	—	—	—	—	145.8
Oxford	130.2	340	—	—	—	—	—	77.4
Rocca di Papa	130.5	321	e 19 28	[+ 8]	—	—	—	23.0
Paris	131.1	334	e 21 46	?PR ₁	—	—	76.8	—
Moncalieri	131.4	328	e 22 7	?PR ₁	—	—	67.7	—
La Paz	132.8	120	e 6 42	?	22 50	?PR ₁	67.8	70.3
Tortosa	138.0	329	21 46	iPR ₁	—	—	e 113.8	137.9
Coimbra	142.6	337	e 20 46	[+62]	e 26 2	?	e 71.8	—
San Fernando	144.8	331	—	—	—	—	86.2	116.2

Additional readings: Riverview gives also $i = +6\text{m.6s.}$, $PS = +10\text{m.50s.}$ and $+11\text{m.13s.}$, $MN = +15.6\text{m.}$, $MZ = +16.0\text{m.}$ Sydney $S = +13\text{m.34s.}$ Adelaide $i = +13\text{m.52s.}$, $e = +16\text{m.46s.}$ Perth $PR_1 = +10\text{m.18s.}$, $SR_1 = +18\text{m.6s.}$ Batavia $i = +17\text{m.26s.}$ Honolulu $eN = +19\text{m.46s.}$ Victoria $S = +29\text{m.36s.}$ ($?SR_1$). Toronto $e = +59\text{m.46s.}$, $eL = +73.2\text{m.}$ Ottawa $eLE = +37.3\text{m.}$ De Bilt $ePR_1 = +21\text{m.14s.}$, $MN = +70.8\text{m.}$ Eskdalemuir $MN = +77.7\text{m.}$ Rocca di Papa $iPN = +19\text{m.49s.}$, $PR_1 = +21\text{m.40s.}$ Coimbra $eL = +55.8\text{m.}$ San Fernando $MN = +89.2\text{m.}$

May 12d. Readings also at 5h. (Toronto), 10h. (La Paz), 16h. (Helwan), 18h. (near Tokyo).

May 13d. 11h. 53m. 10s. Epicentre $34^{\circ}\cdot6\text{N}$. $140^{\circ}\cdot7\text{E}$. (as on 1920 July 13d.).

$$A = -\cdot637, B = +\cdot521, C = +\cdot568.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tyosi	1.1	6	0 33	+16	—	—	0.8	1.1
Tokyo	1.3	324	0 20	0	—	—	0.5	0.6
Mito	1.7	354	0 31	+ 5	(0 45)	- 3	0.8	0.9
Osaka	4.3	272	1 3	- 4	—	—	1.6	2.2
Mizusawa	4.5	358	1 8	- 2	2 9	+ 5	—	—

Additional readings: Tyosi gives also $MN = +1.0\text{m.}$ Mizusawa $PN = +1\text{m.20s.}$

May 13d. 12h. 41m. 45s. (I) }
 19h. 59m. 36s. (II) } Epicentre $0^{\circ}7'N$. $117^{\circ}9'E$. (suggested by De Bilt).
 21h. 9m. 20s. (III) }

A = -·468, B = +·884, C = +·012; D = +·884, E = +·468;
 G = -·006, H = +·011, K = -1·000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Batavia	13·0	238	e 3 12	- 1	—	—	e 7·6	9·5
II	13·0	238	e 3 16	+ 3	—	—	i 7·3	8·8
III	13·0	238	e 3 0	-13	i 6 2	+18	—	9·9
I Manila	14·2	12	e 3 55	+26	—	—	8·5	9·3
II	14·2	12	e 5 1	+91	—	—	7·9	8·5
III	14·2	12	e 3 14	-15	—	—	8·5	9·2
II Perth	32·7	182	—	—	16 36	?L	(16·6)	—
III	32·7	182	9 15	?	15 0	?L	21·4	—
I Colombo	38·4	280	24 15	?L	—	—	(24·2)	33·2
II	38·4	280	—	—	20 24	?L	31·4	32·4
III	38·4	280	—	—	23 40	?L	28·7	31·7
II Kodaikanal	41·3	286	26 48	?	—	—	31·4	32·5
III	41·3	286	23 28	?L	—	—	26·6	32·3
I Riverview	46·6	141	—	—	—	—	e 18·8	26·2
II	46·6	141	—	—	e 20 12	?	e 27·9	33·2
III	46·6	141	e 13 45	?	e 18 29	?	e 25·0	33·2
II Sydney	46·6	141	—	—	15 4	-32	23·7	28·1
I Helwan	86·7	300	24 15	?S	(24 15)	+37	(48·2)	—
II	86·7	300	24 24	?S	(24 24)	+46	—	—
III Hamburg	99·9	325	—	—	—	—	50·7	—
I Uccle	104·1	323	—	—	—	—	e 54·2	—
II	104·1	323	—	—	e 26 6	+28	e 28·4	—
III	104·1	323	—	—	—	—	e 53·7	—
I De Bilt	E. 104·3	324	—	—	—	—	e 58·2	67·9
II	N. 104·3	324	—	—	—	—	e 56·2	57·7
III	E. 104·3	324	e 19 50	?PR ₁	e 26 4	-32	e 59·4	73·2
I	N. 104·3	324	—	—	—	—	e 57·4	62·1
II	E. 104·3	324	—	—	—	—	e 56·7	59·5
III	N. 104·3	324	—	—	—	—	e 55·7	57·4
I Eskdalemuir	106·5	329	—	—	—	—	55·2	—
II	106·5	329	—	—	—	—	55·7	—
III La Paz	163·1	160	20 15	[- 5]	—	—	—	—

Additional readings: Batavia (II) iS? = +8m.26s., eL = +16·4m., (III) S = +6m.50s., MN = +7·4m. Manila (II) MN = +8·6m., (III) MN = +8·7m.
 Perth (II) PR₁ = +13m.25s., (III) PR₁ = +12m.14s., SR₁ = +19m.49s.
 Colombo (II) P = 19h.52m.0s. Riverview (I) MN = +26·8m., (II) MN = +32·7m., (III) MN = +31·9m. Helwan (II) PN = +29m.24s.

May 13d. Readings also at 5h. (La Paz (3)), 6h. (Helwan and La Paz), 8h. (La Paz (2)), 9h. (La Paz and Helwan), 10h. (Helwan and La Paz (3)), 11h. (La Paz (2), Helwan, and near Tokyo), 13h. (near Mostar), 14h. (La Paz (2)), 15h. (Helwan and La Paz (2)), 19h. (near La Paz (2)), 20h. (Batavia and Manila).

May 14d. 11h. 17m. 45s. Epicentre $0^{\circ}7'N$. $117^{\circ}9'E$. (as on May 13d., suggested by De Bilt).

A = -·468, B = +·884, C = +·012; D = +·884, E = +·468;
 G = -·006, H = +·011, K = -1·000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	13·0	238	2 49	-24	6 34	?L	(6·6)	8·3
Manila	14·2	12	3 27	- 2	—	—	8·2	9·0
Taihou	24·6	8	e 5 39	+ 5	(9 57)	+ 2	10·0	—
Zi-ka-wei	30·7	7	e 4 35	-120	e 9 45	-121	—	—
Perth	32·7	182	11 38	?S	(11 38)	-41	(15·0)	—
Colombo	38·4	280	16 15	?L	24 15	?	29·2	30·8
Adelaide	40·6	150	—	—	i 13 51	-24	19·7	28·7
Kodaikanal	41·3	286	7 57	- 8	—	—	26·0	28·2
Mizusawa	E. 43·9	27	8 8	-17	14 29	-32	—	—
	N. 43·9	27	8 12	-13	14 36	-25	—	—
Riverview	46·6	141	e 8 28	-16	e 15 24	-12	e 22·8	25·7
Sydney	46·6	141	—	—	15 15	-21	28·7	32·0
Bombay	47·8	297	e 15 51	?S	(e 15 51)	0	—	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Wellington	66.3	138	—	—	—	—	—	39.2
Honolulu	84.2	69	i 23 11	?S	(123 11)	+ 1	44.1	44.3
Helwan	E. 86.7	300	13 39	+42	—	—	—	58.0
	N. 86.7	300	18 15	?PR ₁	—	—	—	57.5
Lemberg	92.0	320	—	—	23 51	-44	—	25.5
Budapest	95.5	319	e 18 15	?PR ₁	e 26 15	+64	e 54.2	—
Hamburg	99.9	325	e 17 53	?PR ₁	e 24 24	-91	e 52.2	58.2
Rocca di Papa	E. 100.8	313	e 17 27	[-22]	i 18 15	?PR ₁	—	18.5
	N. 100.8	313	e 18 10	?PR ₁	i 18 35	?PR ₁	—	—
Strasbourg	102.6	320	16 45	[-71]	—	—	42.2	58.2
Moncalieri	103.6	317	e 18 29	?PR ₁	28 34	+125	42.6	—
Besançon	104.1	319	19 0?	?PR ₁	—	—	57.2	—
Uccle	104.1	323	e 18 33	?PR ₁	e 24 55	-99	—	55.2
De Bilt	E. 104.3	324	—	—	e 24 46	-110	e 53.2	60.1
Paris	105.8	323	e 18 49	?PR ₁	—	—	54.2	67.2
Edinburgh	106.2	330	—	—	—	—	59.2	—
Eskdalemuir	N. 106.5	329	18 48	?PR ₁	e 25 3	-114	51.7	59.8
	E. 106.5	329	18 53	?PR ₁	i 25 5	-112	—	60.2
Kew	106.5	325	(18 15)	?PR ₁	—	—	—	18.2
Oxford	107.0	325	—	—	i 24 27	-154	—	62.4
Algiers	109.2	310	e 18 57	?PR ₁	30 5	+164	70.2	75.8
La Paz	163.1	160	20 15	[+ 5]	30 51	?	82.2	—

Additional readings and notes: Batavia gives also $i = +3m.9s.$ and $+6m.17s.$, $MN = +6.9m.$ Manila $MN = +9.3m.$ Adelaide $i = +9m.27s.$, $e = +11m.15s.$, $iSR_1 = +17m.9s.$, $i = +18m.15s.$ and $+18m.39s.$ Kodaikanal P has been increased by 10m. Riverview $PS = +15m.44s.$, $SR_1 = +18m.56s.$ and $+19m.9s.$, $MN = +26.7m.$, $MZ = +37.1m.$ Honolulu $SR_1N = +36m.38s.$ Budapest $e = +34m.15s.$ Uccle $e = +27m.45s.$ De Bilt $ePR_1 = +18m.31s.$, $MN = +57.6m.$; epicentre as adopted. Paris $MN = +55.2m.$ Eskdalemuir $eN = iE = +28m.13s.$ La Paz $S = +34m.20s.$, $L = +94.2m.$ and $+101.2m.$

May 14d. 12h. 27m. 24s. Epicentre $29^\circ 2'S$. $177^\circ 0'W$. (as on 1919 Dec. 14d.).

$$A = -.872, B = -.046, C = -.488; \quad D = -.052, E = +.999;$$

$$G = +.487, H = +.026, K = -.873.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Wellington	13.8	206	e 0 0	?	e 6 0	- 3	—	6.6
Riverview	27.5	251	e 5 53	-10	e 10 59	+ 9	e 12.9	14.8
Sydney	27.5	251	4 36	-87	—	—	12.4	14.6
Adelaide	37.8	249	—	—	—	—	e 16.1	23.6
Victoria	91.3	32	—	—	—	—	58.4	—
Kodaikanal	108.5	272	60 36	?L	—	—	(60.6)	65.2
Toronto	114.8	52	—	—	—	—	e 62.0	66.1
Ottawa	E. 117.8	51	—	—	—	—	e 61.1	—
Stonyhurst	155.1	8	—	—	—	—	—	62.1
De Bilt	157.1	357	—	—	—	—	e 88.6	91.2
Uccle	158.4	358	—	—	—	—	—	85.6

Additional readings: Riverview gives also $MN = +13.9m.$ Adelaide $e = +19m.6s.$ Ottawa $LE = +68.6m.$ and $+76.6m.$

1921. May 14d. 20h. 18m. 3s. Epicentre $29^\circ 2'S$. $177^\circ 0'W$.
(as at 12h.).

$$A = -.872, B = -.046, C = -.488; \quad D = -.052, E = +.999;$$

$$G = +.487, H = +.026, K = -.873.$$

The epicentre given by Apia $9^\circ 0'S$. $164^\circ 0'E$. was first tried and modified to $8^\circ 0'S$. $160^\circ 0'E$. (as on 1920 Mar. 22d.). But this gave large positive residuals for the antipodal stations, though in other respects fairly satisfactory. See note at end.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Wellington	13.8	206	e 4 21	+58	—	—	—	8.0
Apia	16.1	18	6 21	?S	(6 21)	-36	—	9.2
Christchurch	16.6	207	7 57	?S	(7 57)	+48	10.6	12.8
Riverview	27.5	251	i 6 10	+ 7	e 10 50	0	e 12.6	16.2
Sydney	27.5	251	5 57	- 6	11 3	+13	13.4	15.6
Adelaide	37.8	249	e 7 27	- 9	i 13 57	+22	e 18.0	24.8

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Honolulu	E.	53.8	22	9 16	-16	i 17 2	- 4	—	24.8
	N.	53.8	22	9 28	- 4	i 16 58	- 8	e 26.2	29.6
Perth		57.0	249	18 8	?S	18 8	+22	31.8	—
Manila		74.2	297	e 11 57	+14	—	—	—	—
Zi-ka-wei		84.2	311	—	—	—	—	e 44.0	—
Berkeley		84.3	40	—	—	e 39 37	?L	e 43.3	47.3
Victoria		91.3	32	35 41	?	—	—	—	46.5
La Paz		97.6	114	13 57	- 1	26 30	+58	53.0	57.8
Colombo		104.7	270	53 57	?L	—	—	66.0	69.0
Kodaikanal		108.5	272	61 57	?L	—	—	71.0	73.8
Chicago		108.5	51	—	—	25 57	-78	e 58.0	—
Ann Arbor		111.4	52	—	—	—	—	62.5	—
Toronto		114.8	52	—	—	e 27 9	-59	30.4	32.0
Georgetown		115.0	58	—	—	56 57	?L	e 62.0	—
Washington		115.0	58	—	—	—	—	e 66.6	—
Cape Town		115.2	194	64 4	?L	—	—	(64.1)	—
Ithaca		116.5	54	—	—	—	—	e 65.4	—
Ottawa	E.	117.8	51	—	—	e 26 3	-149	e 36.6	—
Edinburgh		152.9	8	—	—	—	—	e 85.0	97.0
Eskdalemuir		153.5	8	20 26	[+25]	—	—	85.0	89.4
Hamburg		155.1	350	e 19 57	[-5]	—	—	e 78.0	93.0
Stonyhurst		155.1	8	e 85 27	?L	—	—	(e85.4)	152.0
Helwan		155.4	279	20 57	[+55]	27 57	?	—	—
De Bilt	E.	157.1	357	—	—	e 44 3	?	e 83.0	92.4
	N.	157.1	357	—	—	—	—	e 80.0	97.0
Oxford		157.2	7	24 55	?PR ₁	—	—	44.0	93.2
Kew		157.6	6	—	—	—	—	—	99.0
Budapest		157.9	330	—	—	—	—	e 85.0	—
Vienna		158.3	335	e 20 4	[-2]	—	—	e 49.0	90.4
Uccle		158.4	358	19 57	[-9]	—	—	—	92.0
Strasbourg		160.3	351	19 55	[-13]	—	—	e 33.0	—
Paris		160.4	1	20 13	[+5]	e 33 23	?	86.0	102.0
Moncalieri		163.8	348	e 20 7	[-4]	29 47	?	85.4	—
Florence		164.0	338	—	—	—	—	—	51.0
Rocca di Papa		165.2	331	e 20 15	[+3]	—	—	—	39.0
Coimbra	E.	165.5	37	e 27 52	?PR ₁	e 43 57	?	e 84.2	—
	N.	165.5	37	e 24 14	?PR ₁	32 14	?	e 85.0	—
Barcelona		167.7	3	—	—	—	—	e 87.5	95.2
Tortosa		168.1	11	e 18 57	[-77]	—	—	e 80.0	107.8
San Fernando		169.4	44	21 33	[+79]	—	—	90.8	98.4
Granada		170.3	33	25 41	?PR ₁	—	—	e 72.0	—
Algiers		172.4	0	e 20 23	[+7]	e 31 22	?	49.0	99.0

Additional readings: Christchurch S? = +8m.57s. Riverview ePR₁ = +6m.50s. and +7m.4s., PS = +11m.10s., MN = +15.4m. Apia +6m.51s., T₀ = 20h.18m.21s.? origin 9°0S. 164°0E. Adelaide e = +9m.3s., i = +13m.27s. and +17m.15s. Perth S = +26m.22s., SR₁ = +28m.45s. Honolulu SR₁E = +22m.39s. Toronto iL = +36.2m. Ottawa eE = +29m.57s. Georgetown LN = +67.1m. Budapest e = +89m.57s. Hamburg MZ = +100.0m. Eskdalemuir eN = +22m.58s. and +34m.8s., MN = +87.3m. De Bilt ePR₁N = +20m.25s. Uccle MN = +97.0m. Florence gives P = 19h.46m.? Coimbra eLN = +64.1m. San Fernando MN = +95.4m. Algiers MN = +108.4m.

With T₀ = 20h.18m.15s., epicentre 8°0S. 160°0E. (as on 1920 Mar. 22d.), we have the following residuals for [P]:—

	Δ	[P]		Δ	[P]
	$^{\circ}$	s.		$^{\circ}$	s.
Hamburg	128.4	+30	Paris	135.0	+31
Vienna	129.4	+35	Rocca di Papa	135.6	+32
Eskdalemuir	130.8	+53	Moncalieri	135.9	+23
Uccle	132.6	+21	Tortosa	142.4	-59
Strasbourg	133.2	+17	Algiers	144.4	+21

Near the epicentre the solution is not unsuitable:—

	Δ	P.	S.	L.		Δ	P.	S.	L.
	$^{\circ}$	s.	s.	m.		$^{\circ}$	s.	s.	m.
Riverview	27.1	- 1	- 5	12.4	Honolulu	50.5	0	+23	26.0
Sydney	27.1	-14	+ 8	13.2	Zi-ka-wei	53.8	—	—	43.8
Apia	28.3	- 2	—	—	Colombo	81.3	?	—	65.8
Adelaide	33.4	+15	+75	17.8	Kodaikanal	84.3	?	—	70.8
Christchurch	37.2	+13	—	10.4	Berkeley	85.4	—	?	43.1
Perth	47.4	—	+130	31.6	Victoria	87.3	?	?	—

The columns for P and S are residuals; that for L is L - T₀.

May 14d. 22h. 9m. 30s. Epicentre 20°·0N. 103°·0W.

A = -·211, B = -·916, C = +·342; D = -·974, E = +·225;
 G = -·077, H = -·333, K = -·940.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tacubaya	3·6	99	1 15	+19	—	—	2·5	3·0
Mazatlan	4·5	316	1 11	+ 1	(2 1)	- 3	2·0	3·9
Puebla	4·6	101	0 41	-30	(2 1)	- 5	2·0	2·3
Vera Cruz	6·5	95	2 1	+22	—	—	4·0	4·9
Oaxaca	6·6	115	3 41	?L	—	—	5·5	5·9
Tucson	E. 14·2	332	3 46	+17	—	—	6·8	8·7
	N. 14·2	332	3 23	- 6	—	—	e 8·0	8·9
Denver	E. 19·8	356	—	—	—	—	9·5	12·5
	N. 19·8	356	—	—	—	—	10·0	10·0
Berkeley	E. 24·5	321	i 5 17	-16	—	—	—	13·8
	N. 24·5	321	e 5 7	-26	—	—	—	14·8
Chicago	25·4	27	5 40	- 2	10 8	- 3	12·3	—
Ann Arbor	27·6	32	—	—	—	—	15·8	—
Georgetown	29·2	44	e 6 41	+21	—	—	20·6	—
Washington	29·2	44	6 0	-20	20 30	?L	(20·5)	—
Cheltenham	E. 29·3	45	7 9	+48	11 54	+32	—	18·3
	N. 29·3	45	7 4	+43	—	—	14·2	20·7
Toronto	30·8	35	—	—	e 12 42	+54	—	31·4
Ithaca	31·6	40	e 7 30	+47	—	—	e 18·2	—
Victoria	32·8	336	—	—	(11 9)	-72	11·2	18·7
Ottawa	33·9	36	e 7 0	- 4	e 12 30	- 9	e 19·2	—
Northfield	34·9	40	—	—	e 15 30	?SR ₁	23·2	—
La Paz	50·0	136	i 9 6	- 1	16 17	- 2	22·0	26·5
Honolulu	N. 51·3	282	—	—	—	—	26·1	26·4
Eskdalemuir	79·0	35	e 4 30	?	—	—	38·5	—
Stonyhurst	80·0	38	—	—	—	—	—	109·5
Oxford	81·4	39	—	—	—	—	—	49·2
Kew	82·0	39	—	—	—	—	—	48·5
De Bilt	E. 84·8	36	—	—	—	—	e 42·5	50·6
	N. 84·8	36	—	—	—	—	e 38·5	45·7
Uccle	85·0	38	—	—	—	—	e 37·5	50·5
Granada	85·2	53	i 12 49	0	—	—	—	—
Hamburg	86·7	34	e 15 30	?	—	—	e 45·5	50·5
Strasbourg	87·9	39	—	—	—	—	e 45·5	50·5
Vienna	93·0	35	13 21	-11	—	—	—	66·4

Additional readings and notes: Puebla readings increased by 5m. Ann Arbor gives also LN = +15·6m. Ithaca LN = +20·9m. Ottawa e = +8m.6s., eE = +16m.6s. Honolulu eE = +21m.2s., eN = +21m.10s. (may be eSR₁), eE = +22m.35s., eN = +24m.30s., ME = +25·5m. Hamburg MN = +53·5m.

May 14d. Readings also at 1h. (Manila), 2h., 5h., and 9h. (near La Paz), 12h. (Tokyo), 15h. (Perth), 18h. (Helwan), 19h. (near Mostar), 21h. (Strasbourg, Ottawa, and Toronto), 22h. (near Mizusawa).

May 15d. Readings at 2h. (near Manila), 3h. (near Padova), 4h. (La Paz), 8h. (near Sarajevo and Belgrade), 14h. (Batavia, La Paz, and Manila), 15h. (La Paz), 20h. (near Mizusawa), 22h. (Taihoku).

May 16d. 15h. 12m. 36s. Epicentre 23°·5S. 178°·0E.

A = -·916, B = +·032, C = -·399; D = +·035, E = +·999;
 G = +·398, H = -·014, K = -·917.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	13·7	47	—	—	5 24?	-37	—	—
Wellington	18·0	188	e 3 30	-47	—	—	6·2	7·4
Riverview	25·6	240	e 5 43	- 1	e 10 15	+ 1	e 12·0	15·9
Sydney	25·6	240	5 18	-26	10 12	- 2	13·5	14·9
Adelaide	36·0	243	e 8 6	+44	i 12 24	-46	e 17·2	23·4
Honolulu	E. 50·6	31	—	—	—	—	e 20·1	26·8
	N. 50·6	31	—	—	—	—	e 25·5	48·1

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	67.5	301	e 11 0	- 1	—	—	—	—
Lick	83.2	46	—	—	—	—	e 44.1	—
Victoria	89.0	35	—	—	—	—	43.1	46.1
Kodaikanal	103.7	277	59 18	?L	—	—	(59.3)	—
La Paz	104.0	117	—	—	—	—	53.4	—
Chicago	108.6	52	—	—	e 30 24	?	55.4	—
Toronto	114.9	50	—	—	—	—	e 43.1	71.3
Ottawa	117.7	49	—	—	e 26 24	-128	e 63.4	—
Helwan	149.7	289	30 24	?	—	—	(64.4)	—
De Bilt	150.9	351	—	—	e 37 42	?	e 87.4	97.8
Paris	154.4	353	—	—	e 90 24	?L	e 99.4	104.4
Moncalieri	157.1	342	e 23 18	?PR ₁	—	—	49.8	—
Tortosa	162.6	354	—	—	—	—	e 100.4	106.8

Additional readings and notes: Riverview gives also MN = +14.8m., MZ = +16.2m. Adelaide e = +19m.54s. Victoria L = +44.8m. Toronto eL = +63.3m. and +68.5m., L? = +108.8m? Ottawa e?E = +50m.24s. De Bilt MN = +97.4m.

May 16d. Readings also at 0h. (Helwan), 3h. (near Rocca di Papa and Florence), 7h. and 11h. (La Paz), 12h. (Helwan), 15h., 17h. (2), 18h., and 19h. (2) (La Paz), 20h. (Pompeii), 22h. and 23h. (2) (near La Paz).

May 17d. 23h. 14m. 45s. (I) (Epicentre 21°-0N. 127°-0E. (as on 1919 May 16d.). 23h. 26m. 20s. (II))

A = -562, B = +746, C = +358; D = +799, E = +602;

G = -216, H = +286, K = -934.

The La Paz observation suggests that T₀ might be increased by about 20s. or more; and this would introduce no serious discrepancy elsewhere, but the material is scanty.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
I Taihoku	6.4	310	—	—	—	—	e 4.8	—
I Manila	8.6	223	—	—	—	—	e 5.1	—
II	8.6	223	—	—	—	—	e 4.7	—
I Zi-ka-wei	11.4	335	e 2 57	+ 7	—	—	—	8.2
II	11.4	335	e 2 40	-10	e 5 6	+ 2	—	7.2
I Nagasaki	12.1	12	e 1 20	-100	—	—	—	—
I Osaka	15.6	27	3 45	- 2	—	—	—	—
II	15.6	27	—	—	—	—	—	8.4
I Tokyo	18.4	35	e 5 31	+69	e 7 14	-35	e 9.9	15.5
II Helwan	84.4	300	23 40	?S	(23 40)	+28	—	—
II Vienna	87.2	323	i 13 7	+ 7	e 24 34	+51	e 43.7	55.2
I Hamburg	88.0	328	e 13 15	+10	—	—	—	—
II	88.0	328	13 6	+ 1	—	—	e 37.7	48.7
II De Bilt	E. 91.1	328	e 13 42	+20	e 24 8	-17	e 35.2	51.6
II	N. 91.1	328	—	—	—	—	e 45.7	52.2
II Uccle	92.4	327	—	—	e 23 58	-41	e 45.7	58.7
II Florence	92.6	320	42 20	?L	—	—	(42.3)	53.2
II Strasbourg	92.7	325	e 13 40	+ 9	e 24 21	-21	e 38.7	50.9
II Rocca di Papa	92.8	316	i 13 58	+27	—	—	e 47.7	54.2
II Eskdalemuir	92.8	334	—	—	e 23 57	-46	46.3	48.0
II Stonyhurst	93.5	333	e 24 40	?S	(24 40)	-11	—	55.2
II Moncalieri	94.0	322	—	—	e 24 29	-27	47.4	—
II Kew	94.1	330	—	—	—	—	—	53.7
II Oxford	94.4	330	—	—	i 30 30	?SR ₁	41.9	53.5
II Tortosa	100.7	322	—	—	—	—	e 47.7	63.0
II Algiers	101.7	318	—	—	—	—	43.7	—
II Coimbra	E. 106.1	325	40 18	?	46 58	?	e 53.7	59.1
II	N. 106.1	325	—	—	—	—	e 54.7	59.0
II San Fernando	107.6	323	—	—	—	—	—	56.2
II La Paz	165.0	75	(20 45) [+33]	—	—	—	—	—

Additional readings and notes: Zi-ka-wei (II) gives also MN = +8.1m. Osaka (II) MN = +13.4m. Tokyo (I) MN = +10.2m. Helwan PN = +22m.40s. Uccle gives its readings as on 18d. Rocca di Papa L = +51.1m. San Fernando MN = +68.2m.

May 17d. Readings also at 5h. (Moncalieri and near Lick), 6h. (Moncalieri), 8h. (Manila), 10h. (Manila), 11h. (La Paz and near Athens), 13h. (La Paz), 16h. (Uccle), 21h. (near Mizusawa).

May 18d. Readings at 0h. (near Algiers), 1h. (Algiers and near Mizusawa), 5h. (Batavia), 7h. (near Tokyo, near Tacubaya, and Vera Cruz), 8h. (Manila), 9h. (De Bilt), 12h. (La Paz), 13h. (Apia), 15h. (La Paz), 16h. (Manila), 18h. (near Batavia), 20h. (Taihoku (2)), 23h. (near Batavia).

May 19d. Readings at 0h. (near Tacubaya), 3h. (La Paz and Uccle), 4h. (La Paz (2)), 9h. (near Tacubaya), 14h. (Helwan), 15h. (near Oaxaca and Tacubaya), 18h. (La Paz), 19h. (Helwan), 22h. (Florence and La Paz).

1921. May 20d. 0h. 43m. 10s. Epicentre 35° 0' N. 69° 0' E.

(as on 1920 Feb. 27d.).

A = +.294, B = +.765, C = +.574; D = +.934, E = -.358;

G = +.205, H = +.536, K = -.819.

This old origin is retained in spite of the poverty of the material on the previous date. A focal depth of 0.030 has been adopted.

	Focus	Corr. for	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Simla			-0.2	7.9	117	1 50	-7	e 3 14	-15	—
Dehra Dun			-0.3	8.9	119	1 50	-20	—	—	—
Bombay			-0.9	16.5	167	3 9	-38	6 18	-28	6.5
Calcutta	E.		-1.3	21.0	122	4 26	-11	(8 2)	-15	8.0
	N.		-1.3	21.0	122	4 32	-5	(8 20)	+3	8.3
Kodaikanal			-1.6	25.9	161	9 56	? S	(9 56)	+6	11.0
Colombo			-2.0	29.8	158	—	—	—	—	12.3
Helwan	E.		-2.1	32.0	271	6 20	-7	11 26	-6	26.2
	N.		-2.1	32.0	271	7 26	+59	12 14	+42	16.8
Lemberg			-2.3	35.7	310	e 6 44	-16	—	—	e 14.7
Athens			-2.3	36.3	289	e 7 5	0	i 12 36	-4	e 18.3
Belgrade			-2.4	37.9	300	i 7 16	-2	i 12 56	-7	—
Budapest			-2.5	38.8	307	e 6 45	-39	e 12 30	-44	e 15.8
Mostar			-2.5	39.9	298	i 7 18	-15	i 13 20	-10	—
Vienna			-2.5	40.6	309	i 7 27	-12	9 10	? PR ₁	i 13.6
			-2.5	40.6	309	i 7 42	+3	—	—	i 13.6
Pola			-2.7	42.5	301	e 7 47	-6	i 13 55	-8	i 17.2
Pompeii	E.		-2.7	42.7	296	7 54	-1	14 4	-3	41.8
Zi-ka-wei			-2.7	43.6	80	e 7 42	-20	—	—	—
Rocca di Papa			-2.7	43.9	296	i 8 4	-1	i 14 22	-2	—
Florence			-2.8	44.5	300	E 20	+11	—	—	17.8
Zurich			-2.9	45.9	304	e 8 18	0	i 14 50	+2	—
Strasbourg			-2.9	46.3	307	i 8 22	+1	i 14 55	+1	e 19.8
Moncalieri			-2.9	46.8	302	8 29	+4	15 3	+2	19.5
De Bilt			-3.0	47.6	312	8 31	+1	i 15 12	+2	e 19.4
Besançon			-3.0	47.7	306	8 31	0	15 21?	+10	19.8
Uccle			-3.0	48.2	310	i 8 35	+1	i 15 21	+3	19.3
Paris			-3.1	49.7	310	i 8 47	+3	i 15 42	+6	19.8
Manila			-3.1	50.8	100	e 7 50	-62	—	—	—
Kew			-3.1	51.0	312	5 50	?	—	—	31.8
Dyce	E.		-3.2	51.3	320	E 55	0	15 58	+3	20.1
Barcelona			-3.2	51.6	298	9 4	+8	i 16 10	+11	21.5
Stonyhurst			-3.2	51.9	314	9 2	+4	14 2	-120	20.4
Eskdalemuir			-3.2	52.1	317	i 9 3	+4	i 16 9	+4	23.6
Edinburgh			-3.2	52.1	317	9 2	+3	16 10	+5	20.8
Algiers			-3.2	52.3	292	9 8	+7	i 16 21	+14	23.8
Tortosa			-3.3	53.0	299	9 12	+7	16 27	+12	22.7
Batavia			-3.4	54.5	132	9 44	+30	16 31	-1	—
Granada			-3.5	57.2	295	i 9 40	+9	i 17 29	+24	—
San Fernando			-3.6	59.4	295	9 2	-43	16 56	-35	—
Coimbra	E.		-3.6	59.6	300	10 1	+15	i 17 57	+23	27.5
	N.		-3.6	59.6	300	—	—	—	—	27.2
Ottawa			-4.3	93.6	336	e 13 0	-12	23 15	-51	43.8
Toronto			-4.3	96.1	338	—	—	—	—	43.0
Victoria			-4.3	97.2	9	—	—	—	—	44.4
Ann Arbor			-4.4	98.7	340	—	—	—	—	43.6
Georgetown			-4.4	99.7	334	e 16 34	? PR ₁	i 23 54	-75	—
Washington			-4.4	99.7	334	e 19 45	?	23 46	-83	—
Chicago			-4.4	100.2	343	13 30	-18	23 40	-94	40.8
Melbourne			-4.4	101.3	130	—	—	—	—	—
Riverview			-4.5	103.1	124	—	—	e 32 38	? SR ₁	e 42.5
La Paz			—	137.6	284	i 19 24	[-11]	31 56	?	61.8

For Notes see next page.

NOTES TO MAY 20d. 0h. 43m. 10s.

Additional readings: Athens gives also $iP = +7m.10s.$, $PR_1E = +8m.7s.$, $MN = +20.0m.$ Belgrade gives its reading 1h. late. Budapest $e = +8m.23s.$ Mostar $PR_1 = +9m.26s.$, readings given 1h. late. Vienna $i = +7m.44s.$ Pola $MN = +17.4m.$ Rocca di Papa $iPN = +8m.6s.$ Strasbourg $SR_1 = +17m.51s.$, $MN = +20.9m.$, $MZ = +23.1m.$ Barcelona $SR_1 = +18m.27s.$ Moncalieri $MN = +23.1m.$ De Bilt $MN = +26.3m.$ Epicentre $37^\circ.9N.$ $67^\circ.4E.$ Uccle $PR_1 = +10m.32s.$, $SR_1 = +18m.4s.$ Epicentre $37^\circ.5N.$ $67^\circ.3E.$ Dyce $PR_1 = +10m.56s.$ Eskdalemuir $PR_1 = +11m.4s.$, $SR_1 = +18m.31s.$, $SR_2 = +20m.59s.$, $T_0 = 0h.43m.17s.$ San Fernando $MN = +25.7m.$ Coimbra $ePR_1 = +12m.11s.$, $SR_1N = +19m.21s.$ $T_0 = 0h.43m.19s.$ Ottawa $eN = +18m.0s.$, $LE = +51.8m.$ Toronto $eL = +44.2m.$ Victoria $L = +38.3m.$ Ann Arbor $LN = +45.7m.$ Riverview $MN = +46.4m.$ La Paz $PR_1 = +22m.6s.$, $T_0 = 0h.47m.13s.$

May 20d. 13h. 22m. 0s. Epicentre $2^\circ.0S.$ $128^\circ.5E.$

$$A = -.622, B = +.782, C = -.035; \quad D = +.783, E = +.622; \\ G = +.022, H = -.027, K = -.999.$$

A high focus, as indicated by La Paz, would, in some ways, suit the observations better; but the material is scanty.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	18.2	336	e 4 33	+14	—	—	—	—
Batavia	22.0	258	5 4	- 1	9 2	- 3	10.4	—
Perth	32.2	200	—	—	13 29	+78	19.5	—
Zi-ka-wei	33.9	352	e 6 58	- 6	—	—	—	—
Riverview	38.2	148	e 8 32	+52	—	e 22.9	23.7	—
Sydney	38.2	148	16 12	?S	20 48	?L	26.1	28.2
Melbourne	38.8	159	13 48?	?S	(13 48?)	- 1	19.8?	24.1
Colombo	49.4	281	—	—	—	—	—	35.0
Helwan	97.2	300	37 0	?	—	—	(57.0)	—
De Bilt	111.4	326	—	—	—	e 56.0	—	—
Uccle	112.4	325	—	—	—	—	—	62.0
La Paz	155.2	139	i 20 19	[+17]	—	—	—	—

Additional readings: Perth gives also $PR_1 = +9m.1s.$, $SR_1 = +17m.10s.$
Riverview $MN = +24.5m.$ Melbourne $S = +16m.36s?$

May 20d. 18h. 15m. 40s. Epicentre $43^\circ.8N.$ $11^\circ.2E.$ (as on 1920 Dec. 27d.).

$$A = +.708, B = +.140, C = +.692.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Florence	0.0	—	0 8?	+ 8	—	—	—	0.5
Padova	1.7	17	0 18	- 8	0 50	+ 2	—	1.1
Rocca di Papa E.	2.3	152	—	—	—	e 1.3	2.5	—
Moncalieri	2.8	295	e 0 51	+ 7	—	—	—	—
Strasbourg	5.3	334	e 2 43	?L	—	—	(e 2.7)	—

Additional readings: Florence gives also $P = +0m.32s.$, $M = +0.8m?$ Rocca di Papa $eE = +1m.44s.$, $eN = +2m.10s.$ and $+2m.23s.$

May 20d. Readings also at 1h. (near Osaka and Tokyo), 2h. (La Paz and Riverview), 3h. (La Paz), 4h. (La Paz and near Osaka and Tokyo), 5h. (near Osaka and Tokyo), 6h. (Florence), 8h. (Pompeii and Rocca di Papa), 10h. (Rocca di Papa (2) and Pompeii), 13h. (De Bilt, Lemberg, and Hamburg), 15h. (La Paz), 21h. (La Paz, Rocca di Papa, De Bilt, Belgrade, and near Athens).

1921. May 21d. 8h. 42m. 0s. Epicentre 12° 5N. 124° 5E.

A = -553, B = +805, C = +216; D = +824, E = +566;
G = -123, H = +178, K = -976.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	4.0	302	e 1 21	+19	—	—	2.4	—
Taihoku	12.8	348	e 3 24	+14	(5 41)	+ 2	5.7	9.4
Zi-ka-wei	18.9	352	e 4 30	+ 2	e 7 54	- 6	—	10.8
Nagasaki	20.9	13	4 51	- 1	(8 40)	- 2	8.7	—
Hukuoka	21.8	14	4 58	- 5	8 58	- 3	11.5	15.3
Osaka	24.3	22	5 22	- 9	9 29	-21	—	18.5
Jinsen	25.1	4	6 26	+47	10 53	+48	—	19.7
Batavia	25.6	224	e 5 42	- 2	—	—	e 17.0	—
Tokyo	27.0	28	6 0	+ 2	11 20	+39	e 15.5	16.3
Ootomari	37.5	22	3 10	?	—	—	—	—
Calcutta	E. 35.8	291	5 48	-92	10 18	-169	14.1	20.3
	N. 35.8	291	5 54	-86	10 48	-139	15.4	22.9
Colombo	44.3	269	9 0	+32	14 0	-66	25.0	34.0
Kodaikanal	46.1	274	14 6	?S	(14 6)	-83	29.4	31.9
Adelaide	49.3	164	e 8 36	-26	i 16 12	+ 2	e 22.4	43.6
Riverview	52.8	151	9 18	- 7	e 16 57	+ 3	e 25.9	30.3
Sydney	52.8	151	8 30	-55	17 0	+ 6	27.2	35.5
Melbourne	53.8	160	9 30	- 2	17 18	+12	27.1	38.4
Wellington	71.0	145	—	—	e 21 0	+22	e 35.8	40.0
Honolulu	E. 74.4	71	11 51	+ 6	21 31	+12	35.6	45.8
	N. 74.4	71	—	—	i 21 16	- 3	—	31.0
Helwan	E. 86.5	300	13 24	+28	—	—	—	60.1
	N. 86.5	300	22 54	?S	(22 54)	-42	—	63.4
Lemberg	87.1	320	e 13 0	0	e 23 24	-18	e 51.3	57.8
Budapest	91.0	310	e 13 11	-10	23 34	-50	e 50.0	59.2
Vienna	92.4	322	13 26	- 3	23 33	-66	e 40.0	58.5
Hamburg	93.9	327	e 13 32	- 5	i 24 7	-48	e 43.0	58.3
Victoria	94.8	38	—	—	(25 16)	+12	25.3	53.8
Pola	95.2	319	e 24 12	?S	(e 24 12)	-56	e 54.7	61.4
Pompeii	96.1	315	14 14	+24	18 0	?PR ₁	—	—
De Bilt	97.1	327	e 13 54	- 1	i 24 23	-64	e 53.0	60.7
Rocca di Papa	E. 97.3	316	i 13 49	- 7	e 17 40	?PR ₁	e 45.9	57.4
	N. 97.3	316	i 13 52	- 4	i 17 46	?PR ₁	e 52.9	—
Strasbourg	97.5	323	13 47	-10	e 24 20	-71	e 34.0	61.9
Dyce	97.7	334	24 13	?S	(24 13)	-80	48.4	58.9
Uccle	98.2	326	e 17 0	?PR ₁	e 24 28	-70	e 46.0	62.4
Edinburgh	99.0	333	—	—	24 20	-86	—	61.7
Moncalieri	99.1	320	14 6	0	24 29	-78	39.4	64.0
Besançon	99.2	323	—	—	24 45	-63	—	54.0
Eskdalemuir	99.3	333	e 14 13	+ 6	24 31	-78	46.6	61.3
Stonyhurst	99.9	330	24 30?	?S	(24 30?)	-85	—	65.5
Kew	100.2	329	46 0	?L	—	—	(46.0)	64.0
Paris	100.2	325	—	—	e 24 40	-78	50.0	55.0
Oxford	100.7	329	i 18 15	?PR ₁	i 24 36	-86	—	64.6
Tortosa	105.7	319	—	—	—	—	e 54.0	68.5
Algiers	106.1	315	—	—	25 7	-106	47.0	71.5
Cape Town	110.1	237	25 36	?S	(25 36)	-113	—	64.4
Granada	110.5	318	17 39	?	i 27 43	+10	—	—
Coimbra	E. 111.6	323	e 18 48	?	—	—	e 49.4	71.4
	N. 111.6	323	—	—	30 16	?	e 58.3	71.3
San Fernando	E. 112.6	319	—	—	—	—	—	68.6
Chicago	118.2	26	20 17	?PR ₁	29 58	+82	45.2	—
Ottawa	119.3	14	e 20 18	?PR ₁	—	—	55.0	—
Ann Arbor	119.4	21	—	—	—	—	19.5	—
Toronto	119.8	17	—	—	—	—	67.6	83.2
Georgetown	124.8	18	e 19 0	[- 5]	—	—	e 49.5	—
La Paz	167.1	110	20 25	[+12]	34 43	?	82.3	107.8

Additional readings: Zi-ka-wei gives also PSE = +8m.14s., MN = +11.4m.
Osaka MN = +21.4m. Tokyo MN = +16.0m. Adelaide i = +20m.0s.
Riverview eP = +9m.34s., eS = -17m.4s. (alternatives ?), eSR₁ = +20m.58s.
and +21m.10s. Sydney SR₂ = +21m.36s. Melbourne SR₁ =
+21m.12s., SR₂ = +22m.36s. Wellington e = +25m.48s. and +32m.30s.
Honolulu eSR₁E = +26m.31s. Budapest e = +13m.45s., +16m.55s.,
and L = +27.1m. Hamburg SR₃ = +38m.0s., MN = +59.0m. Pola
MN = +63.0m. De Bilt ePR₁ = +17m.45s., MN = +60.4m. Stras-
bourg MN = +54.9m. Dyce i = +34m.53s. Uccle MN = +55.5m.
Moncalieri MN = +65.7m. Eskdalemuir e? = +18m.7s. Tortosa
readings increased by 1h. Ottawa eLE = +36.7m. Ann Arbor
LN = +19.7m. Toronto L = +39.9m., eL = +81.4m., and +100.1m.

May 21d. 11h. 10m. 20s. Epicentre 35°·0N. 16°·0W.

A = +·787, B = -·226, C = +·574; D = -·276, E = -·961;

G = +·551, H = -·158, K = -·819.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Coimbra	7·9	47	—	—	—	—	5·7	—
Paris	19·4	39	e 4 35	+ 1	e 8 14	+ 4	11·0	10·7
Moncalieri	20·6	54	5 45	+57	9 42	+66	13·6	—
Uccle	21·6	37	e 4 45	-15	e 9 4	+ 7	e 11·0	—
Strasbourg	22·1	45	e 5 6	0	—	—	e 12·8	13·6
Eskdalemuir	22·1	20	7 40	?	—	—	—	—
De Bilt	22·8	35	—	—	e 9 14	- 7	e 11·7	13·4
Rocca di Papa	23·4	65	e 5 20	- 1	—	—	—	6·3
Hamburg	26·0	36	7 40	?PR ₁	—	—	—	—
Ottawa	45·7	302	—	—	—	—	e 17·7	—
Toronto	48·6	300	—	—	—	—	21·6	—
Chicago	54·9	300	—	—	e 12 40	?PR ₁	21·2	—
Manila	115·8	47	e 49 25	?L	—	—	(e 49·4)	—

Additional readings: Strasbourg gives also MN = +13·5m. Eskdalemuir gives simply 11h.18m. to 11h.30m.

1921. May 21d. 22h. 25m. 42s. Epicentre 48°·0N. 157°·0E.

A = -·616, B = +·261, C = +·743; D = +·391, E = +·920;

G = -·684, H = +·290, K = -·669.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	9·8	267	2 25	- 2	—	—	4·6	5·8
Hakodate	13·1	247	3 27	+13	3 53	-113	7·1	7·7
Mito	16·8	232	5 15	+73	—	—	7·5	12·3
Tokyo	17·8	232	4 19	+ 4	7 38	+ 2	e 9·5	9·9
Osaka	20·9	238	4 54	+ 2	8 54	+12	—	13·9
Kobe	21·0	239	e 4 51	- 2	—	—	11·8	—
Hukuoka	24·6	244	5 19	-15	9 44	-11	12·6	17·6
Jinsen	24·6	256	6 26	+52	10 54	+59	—	17·1
Nagasaki	25·5	243	5 42	- 1	—	—	—	—
Zi-ka-wei	31·8	250	e 6 35	-10	e 11 33	-32	—	20·2
Taihoku	36·1	241	—	—	e 12 54	-17	—	—
Honolulu	44·6	110	i 15 20	?S	(i 15 20)	+10	20·8	25·5
	44·6	110	—	—	18 56	?SR ₁	20·5	21·2
Manila	44·7	232	e 8 32	+ 1	—	—	—	—
Victoria	50·5	57	6 35	?	12 59	?PR ₁	21·3	31·2
Berkeley	57·2	68	—	—	—	e 27·6	—	33·6
Calcutta	59·4	271	5 24	?	—	—	—	—
Simla	61·0	285	—	—	—	e 34·2	—	—
Batavia	69·8	234	e 11 27	+11	e 20 38	+14	—	—
Dyce	73·4	349	e 11 32	- 6	21 47	+40	41·0	51·7
Chicago	73·6	45	11 38	- 2	21 10	+ 1	36·6	—
Lemberg	74·1	330	e 11 36	- 7	e 21 12	- 3	e 38·5	43·2
Hamburg	74·7	340	e 11 49	+ 2	e 21 27	+ 5	e 35·3	46·9
Edinburgh	74·8	349	—	—	21 18	- 6	—	52·8
Eskdalemuir	75·3	349	11 51	0	21 32	+ 3	36·3	63·8
Kodaikanal	75·5	270	15 18	?PR ₁	—	—	39·3	44·7
Ottawa	75·8	35	e 15 37	?PR ₁	e 21 33	- 2	48·8	—
Toronto	75·8	39	—	—	e 23 6	+91	e 39·8	47·1
Colombo	76·3	266	44 18?	?	49 18	?	56·3	60·3
Stonyhurst	76·6	348	21 48	?S	(21 48)	+ 4	—	55·8
De Bilt	77·1	343	12 2	0	21 51	+ 1	e 38·3	50·9
Budapest	77·8	333	e 11 56	-10	e 22 11	+13	e 38·3	49·3
Vienna	77·9	335	i 12 7	+ 1	e 22 7	+ 8	e 38·3	49·3
Oxford	78·4	347	12 12	+ 3	22 14	+ 9	—	53·2
Uccle	78·4	344	e 12 9	0	e 22 5	0	e 38·3	47·8
Kew	78·7	347	27 18	?SR ₁	—	—	—	69·3
Belgrade	79·7	330	e 13 35	+78	e 22 37	+17	e 33·8	49·4
Strasbourg	79·9	340	12 16	- 2	e 22 8	-14	e 31·3	54·0
Georgetown	80·6	40	e 19 5	?PR ₁	—	—	50·8	—
	80·6	40	—	—	e 21 28	-62	51·6	—
Paris	80·7	344	e 12 24	+ 1	e 22 28	- 3	41·3	53·3
Besançon	81·5	341	12 27	- 1	—	—	45·3	—
Pola	81·7	335	e 22 30	?S	(e 22 30)	-13	e 44·0	52·1

Continued on next page.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Riverview	82.0	186	—	—	e 32 36	?	e 42.8	57.5
Moncalieri	83.2	339	10 42	-115	21 45	-74	33.1	55.0
Florence	83.4	336	66 24?	?L	—	—	(66.4)	—
Rocca di Papa	84.9	334	i 12 45	-2	i 16 2	?PR ₁	e 46.2	57.2
Pompeii	85.2	332	12 18	-31	—	—	—	—
Barcelona	87.8	341	—	—	—	e 46.0	57.2	—
Helwan	88.2	316	15 18	+132	—	—	—	—
Tortosa	88.8	343	12 59	-10	23 31	-30	e 41.3	54.6
Coimbra	90.9	349	e 11 4	-137	23 39	-44	e 45.3	60.6
Algiers	92.9	339	—	—	e 24 34	-10	49.3	58.8
Granada	93.1	345	—	—	—	e 53.0	—	—
San Fernando	94.2	347	—	—	—	—	—	65.1
La Paz	131.6	63	19 39	[+17]	i 23 0	?PR ₁	82.3	83.7

Additional readings and notes: Ootomari gives MN = +5.4m. Tokyo
 MN = +9.1m. Mito MN = +9.7m. Osaka MN = +15.2m. Zi-ka-wei
 MN = +19.5m. Honolulu SE = +19m.4s. (?SR₁E). Calcutta PN =
 +5m.30s. Dyce readings have all been diminished by 1h. Hamburg
 SR₂ = +30m.8s., MNZ = +49.6m. Ottawa e = +30m.18s. and eE =
 +34m.18s. Toronto e = +29m.48s., eL = +49.3m. De Bilt SR₁ =
 +27m.16s., MN = +49.8m. Budapest e = +32m.20s. Uccle SR₁ =
 +27m.33s., MN = +52.1m. Strasbourg MN = +52.5m. Pola MN =
 +52.7m. Riverview MN = +45.1m. Moncalieri MN = +48.9m.
 Pompeii reading has been increased by 10m. Coimbra MN = +61.0m.

May 21d. 23h. 37m. 20s. Epicentre 12°.5N. 124°.5E. (as at 8h.).

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Manila	4.0	302	e 1 19	+17	—	—	2.4	3.0
Taihoku	12.8	348	e 4 36	+86	—	—	—	—
Zi-ka-wei	18.9	352	e 4 23	-5	e 7 49	-11	—	—
Osaka	24.3	22	5 9	-22	—	—	—	23.3
Batavia	25.6	224	e 5 54	+10	i 9 0	-74	—	—
Riverview	52.8	151	—	—	e 16 46	-8	e 28.9	—
Hamburg	93.9	327	—	—	e 22 40	-135	e 53.7	—
De Bilt	97.1	327	—	—	—	—	e 55.7	60.8
Florence	97.4	319	10 40	?	—	—	—	42.7
Eskdalemuir	99.3	333	—	—	—	—	52.7	—
La Paz	167.1	110	20 23	[+10]	—	—	—	—

Additional readings: Osaka gives also MN = +12.1m. De Bilt MN =
 +60.4m.

May 21d. Readings also at 2h. (near Tokyo), 4h. (La Paz), 5h. (Hamburg and
 De Bilt), 6h. (Manila, Zi-ka-wei, Taihoku, and near Padova), 7h.
 (Helwan), 10h. (Manila), 11h. (Manila), 12h. (La Paz and near Manila),
 13h. (De Bilt and Manila), 14h. (Helwan and Manila), 15h. (La Paz and
 Manila), 16h. (Helwan and Manila (2)), 17h. (De Bilt and Manila), 19h.
 (Manila), 20h. (De Bilt and Manila).

May 22d. 18h. 22m. 18s. Epicentre 18°.5N. 68°.0W (as on 1918 Oct. 25d.).

A = +.355, B = -.879, C = +.317; D = -.927, E = -.375;
 G = +.119, H = -.294, K = -.948.

The Epicentre might be moved about 1° further W. (to 69°.0W.).

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Porto Rico	E.	2.5	98	0 56	+17	—	1.4	2.0
	N.	2.5	98	0 56	+17	—	1.3	1.8
Port au Prince	N.E.	4.1	271	0 46	-18	1 15	-38	1.8
	N.W.	4.1	271	0 46	-18	1 11	-42	2.0
Washington		21.9	341	5 12	+ 8	9 4	+ 1	—
Chicago		28.6	329	—	—	e 10 52	-18	13.7
La Paz		35.0	180	7 22	+ 9	e 14 25	?SR ₁	21.8
Tortosa		62.0	51	—	—	—	e 28.7	30.8
Uccle		64.7	41	—	—	—	—	30.7
De Bilt	E.	65.2	40	—	—	—	e 31.7	37.7
	N.	65.2	40	—	—	—	e 28.7	40.7
Hamburg		68.1	38	—	—	—	e 38.7	—

No additional readings.

May 22d. 21h. 23m. 16s. Epicentre $37^{\circ}0'N$. $28^{\circ}7'E$. (as on 1920 May 1d.).

$A = +.700$, $B = +.383$, $C = +.602$; $D = +.480$, $E = -.877$;
 $G = +.528$, $H = +.289$, $K = -.799$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	4.0	286	e 0 59	- 3	i 1 49	- 1	i 2.2	2.5
Helwan	7.5	162	3 44	?L	—	—	(3.7)	—
Lemberg	13.2	347	—	—	—	—	e 8.9	—
Rocca di Papa	13.2	296	e 3 23	+ 7	e 5 54	+ 5	e 8.3	—
Vienna	14.4	325	—	—	—	—	8.7	—
Moncalieri	17.6	304	e 4 16	+ 4	—	—	9.6	—
Strasbourg	19.1	314	e 4 31	+ 1	—	—	10.7	—
Hamburg	21.0	328	—	—	—	—	e 12.7	—
Uccle	22.1	316	—	—	e 8 48?	-19	e 11.7	—
Tortosa	22.1	289	—	—	—	—	e 7.7	15.8
De Bilt	22.4	320	—	—	—	—	e 12.7	15.4
La Paz	105.2	261	60 50	?L	—	—	(60.8)	—

Additional readings: Athens gives also MN $- +2.4m.$, $T_0 = 21h.23m.14s.$
 Helwan PN $= +5m.44s.$, Rocca di Papa e $= +4m.10s.$, eL $= +9.9m.$
 De Bilt MN $= +13.1m.$

May 22d. 23h. 11m. 0s. Epicentre $36^{\circ}1'N$. $137^{\circ}3'E$. (as on 1920 July 3d.).

$A = -.594$, $B = +.548$, $C = +.589$.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	2.0	0 39	+ 8	0 50	- 5	1.4	1.4
Osaka	2.1	0 31	- 2	—	—	1.1	1.1
Mizusawa	4.3	1 17	+10	—	—	2.4	—

No additional readings.

May 22d. Readings also at 2h. (Manila), 3h. (near La Paz), 5h. (Hamburg),
 8h. (Manila), 12h. (La Paz), 13h. (2) and 16h. (Manila), 18h. (Tortosa),
 23h. (near Tokyo).

May 23d. 4h. 13m. 18s. Epicentre $12^{\circ}5'N$. $124^{\circ}5'E$. (as on May 21d.).

$A = -.553$, $B = +.805$, $C = +.216$; $D = +.824$, $E = +.566$;
 $G = -.123$, $H = +.178$, $K = -.976$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	4.0	302	e 1 20	+18	—	—	2.4	3.0
Taihoku	12.8	348	e 4 13	+63	—	—	—	—
Zi-ka-wei	18.9	352	e 4 28	0	e 7 56	- 4	—	—
Nagasaki	20.9	13	5 4	+12	—	—	—	—
Osaka	24.3	22	5 29	- 2	9 53	+ 3	—	26.4
Batavia	25.6	224	5 52	- 8	—	—	—	—
Tokyo	27.0	28	e 5 33	-25	—	—	—	—
Riverview	52.8	151	i 17 2	?S	(i 17 2)	+ 8	e 25.0	35.5
Melbourne	53.8	160	—	—	17 42	+36	—	42.7
Helwan	86.5	300	24 42	+?S	(24 42)	+66	—	—
De Bilt	97.1	327	—	—	e 24 24	-63	e 53.7	63.1
Uccle	98.2	326	—	—	e 26 12	+34	—	53.7
Edinburgh	99.0	333	—	—	—	—	—	72.7
Moncalieri	99.1	320	e 13 49	-17	—	—	e 41.0	—
Eskdalemuir	99.3	333	—	—	e 32 42	?SR ₁	49.7	—
Kew	100.2	329	—	—	—	—	—	65.7
Tortosa	105.7	319	—	—	—	—	e 56.7	—
Coimbra	111.6	323	—	—	—	—	e 57.7	—
La Paz	167.1	110	e 20 36	[+23]	—	—	—	—

Additional readings: Manila gives also MN $= +2.9m.$, Osaka MN $= +2.4m.$, Riverview eS? $= +21m.2s.$, MN $= +32.6m.$, Helwan PN $= +25m.42s.$, De Bilt eE $= +26m.42s.$, MN $= +55.9m.$, Zante ($\Delta = 110^{\circ}0'$) gives simply 4h. Coimbra reading has been increased by 1h.

May 23d. A series of shocks of which the initial wave is recorded below do not seem to have their origin at the usual seat of disturbance $43^{\circ}8'N. 11^{\circ}2'E$. The stations are not sufficiently numerous to allow a trustworthy determination to be made.

Zurich	Padova	Besançon	Strasbourg	Pola	Vienna
h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
6 16 18					
6 17 28		6 17 48?	6 17 48	6 18 29	6 18 51
6 19 35					
6 24 48	6 24 17		6 24 59		6 26 34
14 50 34			14 51 37		

May 23d. Readings also at 2h. (Zante, near Athens, and near Manila (2)), 3h. (near Manila (2)), 4h. (La Paz), 5h. (near Colombo), 8h. (Manila), 11h. (La Paz), 12h. (Manila and near Tokyo), 14h. (Manila), 15h. (La Paz), 17h. (Taihoku), 20h. (La Paz), 21h. (near Mizusawa (3) and near Manila), 22h. (near Mizusawa).

May 24d. Readings at 1h. (near Zurich (2) and Strasbourg), 2h. (near Strasbourg and Zurich), 3h. (near Lick and near Mizusawa), 6h. (Taihoku and Helwan), 9h. (near Mizusawa), 11h. (Manila), 12h. (La Paz, Taihoku, Vera Cruz, near Oaxaca, and near Mizusawa), 15h. (La Paz), 17h. (Rocca di Papa and near Ootomari and Mizusawa), 21h. (La Paz), 22h. (Rocca di Papa).

May 25d. Readings at 0h. (Riverview), 1h. (near Manila), 2h. (De Bilt), 3h. (Colombo), 6h. (Taihoku), 9h. (Zi-ka-wei and near Manila), 10h. (Helwan), 12h. (Lemberg and Helwan), 15h. (Manila), 16h. (La Paz, Uccle, De Bilt, and Manila), 17h. (Manila and Helwan), 23h. (Helwan).

May 26d. 5h. 4m. 27s. Epicentre $39^{\circ}3'N. 21^{\circ}0'E$. (as on 1919 Dec. 22d.).

$$A = +.722, B = +.277, C = +.633.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2.6	120	e 0 40	- 1	e 1 13	+ 1	e 1.3	1.7
Mostar	4.7	331	e 1 3	-10	e 2 3	- 6	—	2.6
Pompeii	5.1	289	e 1 37	+18	—	—	—	—
Belgrade	5.5	356	e 1 15	-10	e 2 24	- 7	—	3.4
Rocca di Papa	6.8	294	e 1 21	-23	—	—	—	4.4
Uccle	16.4	320	—	—	—	—	e 9.0	—
De Bilt	16.8	325	—	—	—	—	e 9.2	—

Belgrade gives also $eP = +1m.22s$.

May 26d. Readings also at 0h. (Manila), 2h. (Vienna), 7h. and 8h. (Kobe), 11h. (De Bilt, Belgrade, Mostar, Rocca di Papa, and near Athens), 16h. (De Bilt), 17h. (La Paz), 22h. (near Mizusawa), 23h. (Manila and Kobe).

May 27d. Readings at 5h. (De Bilt), 6h. (Manila), 7h. (near Kobe and Osaka), 8h. (Taihoku), 13h. (Helwan (2) and La Paz), 15h. (Taihoku), 19h. (La Paz and near Osaka and Tokyo), 21h. (Manila).

May 28d. 19h. 18m. 56s. Epicentre $5^{\circ}2'N. 129^{\circ}4'E$.

$$A = -.632, B = +.770, C = +.091; \quad D = +.773, E = +.635; \\ G = -.058, H = +.070, K = -.996.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	12.5	319	3 13	+ 7	—	—	7.1	8.4
Batavia	25.2	243	5 40	0	—	—	e 18.1	—
Zi-ka-wei	27.0	345	e 5 52	- 6	e 10 39	- 2	—	—
Tokyo	31.7	17	—	—	e 11 4	-59	—	—
Riverview	44.2	153	—	—	e 15 8	+ 3	e 27.8	29.6
Sydney	44.2	153	18 58	?SR ₁	—	—	26.5	30.6
Helwan	94.4	301	23 4	?S	(23 4)	-116	—	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Victoria	97.4	40	40 6	?L	—	—	45.5	56.2
Hamburg	102.5	329	—	—	e 25 4	-76	e 52.1	60.1
Rocca di Papa	105.8	316	e 23 52	?	e 26 34	-16	e 55.6	—
De Bilt	105.8	328	—	—	e 25 14	-96	e 53.1	62.6
Strasbourg	106.1	323	—	—	—	—	e 53.1	56.1
Uccle	106.9	327	—	—	e 24 34	-146	e 50.1	65.1
Edinburgh	107.6	334	—	—	—	—	56.1	—
Moncalieri	107.8	321	e 18 34	?PR ₁	28 28	+80	45.5	—
Eskdalemuir	108.0	334	—	—	e 25 24	-106	49.1	61.0
Stonyhurst	108.5	330	e 40 4	?L	—	—	(40.1)	—
Paris	108.9	326	—	—	e 28 4	+46	59.1	65.1
Oxford	109.2	330	—	—	—	—	—	66.1
Toronto	124.7	24	—	—	—	—	56.0?	—
La Paz	159.5	124	21 7 [+60]	—	—	—	91.1	—

Additional readings and notes: Manila gives also MN = +7.3m. Riverview
 eS? = +15m.41s., eSR₁ = +18m.46s., and +19m.6s. Helwan PN =
 +30m.4s. Hamburg MN = +58.1m. Rocca di Papa L = +66.6m.
 De Bilt MN = +57.8m. Epicentre 4°·7N. 132°·3E. Eskdalemuir eN
 = +34m.18s., MN = +58.5m. Paris M = +67.1m. Melbourne
 (Δ = 45°·4) gives P = 19h.15m.6s., PR₁ = 19h.19m.12s., S = 19h.23m.36s.,
 L = 19h.34m.24s., M = 19h.38m.18s.

May 28d. 20h. 3m. 42s. Epicentre 48°·0N. 127°·5W.

A = -·407, B = -·531, C = +·743; D = -·793, E = +·609;
 G = -·452, H = -·590, K = -·669.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Victoria	2.8	77	0 56	+12	—	—	1.6	2.9
	2.8	77	1 8	?S	(1 8)	- 9	1.8	2.0
Sitka	10.2	335	e 2 11	-22	—	—	—	5.6
Berkeley	10.8	158	e 3 36	+55	—	—	—	11.3
Lick	11.5	156	—	—	—	—	e 7.3	—
St. Louis	28.4	96	e 6 12	0	e 11 6	0	e 14.8	17.9
Chicago	28.6	88	6 21	+ 7	10 58	-12	14.3	—
Ann Arbor	30.9	85	—	—	—	—	19.2	—
Toronto	33.2	80	—	—	—	—	i 17.8	18.4
Ottawa	34.9	75	—	—	e 12 40	-14	e 16.8	18.7
Ithaca	35.6	80	—	—	e 16 48	?L	e 18.8	—
Honolulu	36.2	234	—	—	—	—	e 16.8	18.7
	36.2	234	—	—	—	—	e 16.7	18.0
Georgetown	37.0	85	—	—	18 34	?L	e 19.8	20.2
	37.0	85	e 15 7	?	18 27	?L	e 19.8	20.2
Washington	37.0	85	—	—	—	—	e 16.6	—
Cheltenham	37.2	85	—	—	—	—	e 18.9	20.2
	37.2	85	—	—	—	—	e 17.2	20.4
Northfield	37.4	75	—	—	—	—	e 18.3	—
Edinburgh	66.2	31	—	—	—	—	35.3	—
Eskdalemuir	66.6	31	—	—	e 19 44	- 1	41.3	—
Stonyhurst	68.0	32	—	—	—	—	—	39.3
Oxford	70.2	33	—	—	i 20 33	+ 5	—	41.1
De Bilt	72.0	28	—	—	e 20 50	0	e 36.3	44.2
Hamburg	72.2	26	e 11 40	+ 9	—	—	e 40.3	—
Uccle	72.9	30	—	—	—	—	e 32.3	—
Paris	74.0	32	e 11 56	+14	—	—	33.3	41.3
Strasbourg	75.9	29	12 4	+10	—	—	e 40.3	45.3
Tortosa	80.0	37	—	—	—	—	e 42.3	48.4
La Paz	83.3	125	e 12 46	+ 8	—	—	63.3	67.8
Rocca di Papa	83.6	29	i 11 48	-52	—	—	—	—
Helwan	99.8	19	60 18	?L	—	—	(60.3)	—

Additional readings and notes: Victoria, all readings have been increased by
 2m. Ann Arbor LN = +19.1m. Reading given as 22h. Toronto
 L = +32.7m. Ottawa eEV = +15m.13s. Cheltenham eE = +19m.36s.,
 eN = +19m.40s. De Bilt MN = +43.7m. Helwan PN = +64m.18s.

May 28d. Readings also at 2h., 10h., and 16h. (La Paz).

May 29d. Readings at 11h. (La Paz), 12h. (Victoria and Helwan), 21h. (Tokyo,
 Manila, and Moncalieri).

May 30d. Readings at 4h. (Zi-ka-wei and near Manila), 5h. (De Bilt), 7h. (Helwan), 10h. (La Paz), 14h. (near Riverview), 15h. (Helwan), 18h. (Manila, La Paz, Taihoku, and Helwan), 20h. (near Tokyo), 22h. (La Paz and near Athens).

May 31d. Readings at 1h. (near Athens), 5h. (near Tacubaya), 6h. (near Mizusawa), 9h. (La Paz (2)), 11h. (Manila), 21h. (Riverview, Melbourne, Christchurch, and near Tokyo), 22h. (Manila and Christchurch).

June 1d. 19h. 35m. 38s. Epicentre $54^{\circ}0'N$. $156^{\circ}0'E$. (as on 1914 Mar. 18d.).

A = -537, B = +239, C = +809; D = +407, E = +914;
G = -739, H = +329, K = -588.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	18.0	220	4 36	+19	7 57	+17	—	—
Tokyo	21.6	218	e 5 3	+ 3	—	—	—	—
Manila	48.0	228	e 8 22	-32	—	—	—	—
Hamburg	68.8	340	e 11 10	0	i 20 13	+ 1	e 32.4	—
Eskdalemuir	69.4	348	—	—	i 20 15	- 4	—	—
De Bilt	71.2	341	—	—	i 20 40	0	e 33.4	—
Uccle	72.5	341	—	—	e 20 22	-34	—	51.4
Batavia	72.8	232	—	—	e 20 53	- 7	—	21.2
Strasbourg	74.0	338	e 11 43	+ 1	(e 21 12)	- 2	e 21.2	—
Tortosa	82.9	341	12 24	-11	22 44	-12	—	—
Helwan	83.5	314	23 22	?S	(23 22)	+19	—	—

Additional readings: Mizusawa gives also PN = +4m.32s. De Bilt e = +21m.20s.

June 1d. Readings also at 1h. (La Paz), 8h. (Riverview, Manila, and Melbourne), 9h. (Cape Town, Perth, and De Bilt), 12h. (Manila), 13h. (De Bilt), 14h. (near Balboa Heights), 16h. (Manila and Rocca di Papa), 17h. (La Paz), 19h. (La Paz and Budapest), 22h. (Zi-ka-wei).

June 2d. 7h. 6m. 20s. Epicentre $11^{\circ}0'S$. $97^{\circ}0'E$.

A = -120, B = +974, C = -191; D = +993, E = +122;
G = +023, H = -189, K = -982.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Batavia	10.8	64	e 2 58	+17	e 5 7	+17	—	8.1
Colombo	24.8	316	—	—	—	—	10.7	16.7
Perth	27.2	143	18 40	?L	—	—	(18.7)	—
Kodaikanal	28.8	317	11 16	?S	(11 16)	+ 3	13.9	15.2
Manila	34.9	44	7 3	- 9	12 45	- 9	17.0	22.5
Taihoku	43.2	34	—	—	—	—	e 18.7	—
Melbourne	50.4	131	—	—	—	—	—	43.7
Riverview	54.3	126	—	—	e 29 4	?L	e 32.5	39.0
Rocca di Papa	E. 93.1	312	i 13 26	- 7	i 24 34	-12	—	—
	N. 93.1	312	i 14 4	+31	i 24 20	-26	—	—
Hamburg	97.1	324	e 13 53	- 2	e 24 45	-42	e 49.7	—
De Bilt	99.8	322	—	—	25 11	-43	e 51.7	66.6
Eskdalemuir	104.9	325	—	—	e 25 54	-47	48.7	—
La Paz	148.8	208	78 5	?L	—	—	(78.1)	—

Additional readings: Colombo gives also P = 7h.4m.0s. Manila PR₁E = +7m.53s., PR₁N = +7m.57s., PR₂E = +8m.54s., PR₂N = +8m.35s., SR₁E = +14m.50s., SR₁N = +14m.33s., SR₂E = +15m.44s., SR₂N = +15m.11s., MN = +22.7m. Riverview MN = +39.5m. De Bilt MN = +66.0m.

June 2d. Readings also at 2h. (La Paz), 6h. (Rocca di Papa and Zi-ka-wei), 12h. and 16h. (La Paz), 19h. (near Athens (2)).

June 3d. Readings at 3h. (Kobe), 4h. (Manila and Batavia), 6h. (near Tokyo), 12h. (Mizusawa and near Tokyo).

June 4d. Readings at 1h. (Chicago, Ann Arbor, Georgetown, Ottawa, Victoria, and Toronto), 2h. (De Bilt), 4h. (Melbourne and Riverview), 5h. (Helwan), 6h. (near Rocca di Papa), 13h. (Helwan), 14h. (near Mizusawa), 16h. (Batavia, Manila, and Lemberg), 17h. (Uccle, De Bilt, and Helwan), 19h. (near Simla).

June 5d. Readings at 1h. (Riverview), 2h. (Rocca di Papa), 3h. (Taihoku), 8h. (La Paz), 10h. (Manila and Helwan), 11h. (La Paz (2)), 18h. (Riverview and Melbourne), 19h. (Stonyhurst, Eskdalemuir, Kew, Helwan, and De Bilt), 20h. (near Tokyo), 23h. (Melbourne).

June 6d. 0h. 9m. 15s. Epicentre $6^{\circ}0'N$. $83^{\circ}0'W$. (as on 1920 Sept. 24d.).

$$A = +.121, B = -.987, C = +.104; \quad D = -.993, E = -.122; \\ G = +.013, H = -.104, K = -.994.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	E.	4.5	49	1 29	+19	2 3	- 1	2.2	2.2
	N.	4.5	49	1 21	+11	1 57	- 7	2.1	2.1
La Paz		26.8	147	5 56	0	10 33	- 4	13.8	17.5
De Bilt	E.	84.2	40	—	—	—	—	e 42.8	43.6

No additional readings.

June 6d. Readings also at 10h. (Helwan), 16h. (Tortosa), 23h. (Christchurch).

June 7d. Readings at 0h. (La Paz), 4h. (Manila and Batavia), 8h. (Tortosa), 9h. (La Paz), 11h. (Strasbourg), 14h. (Manila), 15h. (Helwan and near Mizusawa), 16h. (Manila), 19h. (La Paz).

June 8d. Readings at 4h. (La Paz), 5h. (Helwan and De Bilt), 8h. and 14h. (Helwan), 15h. (near Batavia), 17h. (La Paz).

June 9d. 10h. 34m. 50s. Epicentre $5^{\circ}6'N$. $126^{\circ}3'E$. (as on 1918 Feb. 27d.).

$$A = -.589, B = +.802, C = +.098; \quad D = +.806, E = +.592; \\ G = -.058, H = +.079, K = -.995.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	10.4	330	e 2 38	+ 2	—	—	4.2	5.8
Batavia	22.8	239	5 15	0	i 9 19	- 2	e 12.2	—
Zi-ka-wei	25.9	350	e 5 44	- 3	e 10 16	- 4	—	—
Helwan	91.5	300	45 10	?L	—	—	(45.2)	—
La Paz	162.2	129	20 24	[+15]	—	—	21.2	—

Additional readings: Manila gives also $MN = +6.5m$. Helwan $PN = +43m.10s$.

June 9d. Readings also at 1h. (near Tokyo and Mizusawa), 2h. (near Tokyo), 10h. (La Paz), 21h. and 22h. (near Tokyo), 23h. (near Oaxaca).

June 10d. 1h. 10m. 30s. Epicentre $39^{\circ}3'N$. $21^{\circ}0'E$. (as on May 26d.).

$$A = +.722, B = +.277, C = +.633; \quad D = +.358, E = -.934; \\ G = +.591, H = +.227, K = -.774.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	2.6	120	0 41	0	(1 5)	- 7	1.1	1.2
Belgrade	5.5	356	e 2 2	+37	e 3 56	?L	(e 3.9)	4.0
Rocca di Papa	6.8	294	—	—	e 2 42	-23	e 6.0	7.6
Helwan	12.7	135	10 30	?L	—	—	(10.5)	—
Hamburg	16.1	336	—	—	—	—	e 10.5	—
De Bilt	16.8	325	—	—	—	—	e 10.8	11.3

Helwan gives also $PN = +9m.30s.$

June 10d. Readings also at 2h. (Manila), 3h. (La Paz), 11h. (Nagasaki), 12h. (La Paz and Helwan), 17h. (Manila), 18h. (near Tacubaya, Oaxaca, and Vera Cruz), 19h. (Manila).

June 11d. Readings at 1h. and 2h. (La Paz), 5h. (Helwan), 11h. (Nagasaki), 19h. (Manila).

June 12d. Readings at 0h. (near Nagasaki), 1h. (near Port au Prince), 2h. (La Paz), 3h. (near Berkeley and Lick), 19h. (Tokyo and La Paz), 23h. (Batavia and Riverview).

June 13d. Readings at 3h. (Vera Cruz and near Tacubaya), 6h. (Manila), 7h. (La Paz), 12h. (Taihoku), 15h. (Helwan), 16h. (Manila (2) and Wellington), 17h. (Budapest, Belgrade, and near Athens), 21h. (Pompeii and Rocca di Papa).

June 14d. 1h. 41m. 55s. Epicentre $48^{\circ}0'N$. $35^{\circ}0'E$.

$$A = +.548, B = +.384, C = +.743; \quad D = +.574, E = -.819; \\ G = +.609, H = +.426, K = -.669.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Lemberg	7.4	288	—	—	—	—	e 6.0	7.6
Budapest	10.7	273	e 1 5	?L	—	—	—	6.1
Vienna	12.4	278	—	—	—	—	e 6.1	7.6
Pola	14.8	266	e 6 21	?S	(e 6 21)	- 6	e 6.9	—
Hamburg	16.7	299	e 4 5	+ 4	—	—	—	—
Rocca di Papa	16.9	257	—	—	—	—	e 5.7	—
Strasbourg	18.1	282	e 4 7	-11	—	—	9.1	—
Helwan	18.4	190	7 5	?S	(7 5)	-44	(10.1)	—
De Bilt	19.5	293	—	—	8 24	+11	10.3	11.4
Uccle	20.0	290	e 4 41	0	e 8 23	0	e 10.4	11.5
Paris	21.4	284	—	—	—	—	e 10.9	11.1
Oxford	23.4	293	—	—	—	—	—	14.8
Stonyhurst	24.0	298	14 23	?L	—	—	(14.4)	—
Edinburgh	24.5	303	—	—	10 5	+11	—	—

Additional readings: Rocca di Papa gives also $eL = +12.8m.$ De Bilt $eN = +3m.57s.$ Belgrade ($\Delta = 10^{\circ}5'$ Az. = $258^{\circ}0'$) gives $eP = 1h.37m.45s.,$ $eS = 1h.43m.3s.,$ $eL = 1h.44m.56s.,$ $M = 1h.45m.59s.$ Apparently the time is in error.

June 14d. 4h. 47m. 0s. Epicentre $37^{\circ}5'N$, $142^{\circ}5'E$. (as on 1918 Aug. 25d.).

$$A = -\cdot630, B = +\cdot483, C = +\cdot609.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	2.0	327	0 32	+ 1	0 58	+ 3	—	—
Mito	2.0	236	0 26	— 5	(0 40)	—15	0.7	1.0
Tokyo	2.9	231	0 41	— 4	1 8	—12	1.5	2.6
Numadu	3.3	244	e 0 58	+ 6	—	—	1.7	—
Hakodate	4.5	343	2 19	?L	2 48	?	3.1	3.4
Osaka	6.3	248	2 23	+47	(2 23)	—29	3.3	4.1

Additional readings: Tokyo gives also MN = +2.7m. Hakodate MN = +3.6m.

June 14d. 8h. 44m. 38s. Epicentre $37^{\circ}8'N$, $117^{\circ}3'E$.

$$A = -\cdot362, B = +\cdot702, C = +\cdot613; \quad D = +\cdot889, E = +\cdot459;$$

$$G = -\cdot281, H = +\cdot545, K = -\cdot790.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	18.3	90	e 4 16	— 5	—	—	—	—
Mizusawa	18.6	79	4 25	+ 1	7 53	0	—	—
Manila	23.5	171	e 5 24	+ 1	—	—	—	—
Victoria	78.4	36	—	—	—	—	36.9	40.5
Toronto	97.2	12	—	—	—	—	—	40.3
La Paz	158.2	14	i 19 59	[— 7]	—	—	—	—

Mizusawa gives also PN = +4m.22s.

June 14d. Readings also at 0h. (Batavia), 1h. (Athens), 6h. and 7h. (near Batavia), 19h. (Manila), 21h. (Athens and near La Paz (3)).

June 15d. Readings at 9h. (Manila), 16h. (near Mostar), 17h. (Vera Cruz (2) and Tacubaya (4)), 18h. (Vera Cruz and Tacubaya), 19h. (Chicago, Ottawa, Georgetown, and near Tacubaya and Vera Cruz), 20h. (La Paz), 21h. (near Puebla), 22h. (Vera Cruz and near Tacubaya), 23h. (Vera Cruz).

June 16d. 9h. 4m. 52s. Epicentre $65^{\circ}0'S$, $0^{\circ}0'$ (as on 1917 July 15d.).

$$A = +\cdot423, B = \cdot000, C = -\cdot906; \quad D = \cdot000, E = -1\cdot000;$$

$$G = -\cdot906, H = \cdot000, K = -\cdot423.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	65.9	283	e 10 52	+ 2	e 19 35	— 1	30.7	33.4
Helwan	97.9	27	29 8	?S	(29 8)	?SR ₁	—	—
Uccle	115.8	4	—	—	e 30 14	+118	e 55.1	62.1
Manila	116.0	113	—	—	e 26 8	—130	—	—
Kew	116.5	0	—	—	—	—	—	53.1
Le Bilt	117.1	3	—	—	—	—	e 57.1	62.6
Eskdalemuir	120.3	358	—	—	—	—	58.1	—

Additional readings: Helwan gives also PN = +31m.8s. (?SR₁N). De Bilt MN = +64.4m.

June 16d. Readings also at 14h. (near Mostar).

June 17d. 8h. 10m. 0s. I (Epicentre $30^{\circ}0'N. 114^{\circ}0'W.$
10h. 19m. 30s. II)

A = -·352, B = -·791, C = +·500 ; D = -·914, E = +·407 ;
G = -·203, H = -·457, K = -·866.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
I Tucson	E.	3·5	50	0 56	+ 1	1 36	- 1	1·8	2·4
I	N.	3·5	50	—	—	1 41	+ 4	1·8	2·1
II	E.	3·5	50	e 1 17	+22	—	—	1·8	1·9
II	N.	3·5	50	0 49	- 6	—	—	1·6	1·8
I Berkeley	E.	10·5	321	e 2 41	+ 4	—	—	i 5·0	6·8
I	N.	10·5	321	e 3 1	+24	—	—	i 5·0	6·2
II	N.	10·5	321	e 2 44	+ 7	—	—	—	4·5
I Victoria		19·7	342	—	—	—	—	9·2	10·6
II		19·7	342	—	—	—	—	9·0	—
I Chicago		24·2	54	12 5	?L	—	—	(12·1)	—
II		24·2	54	e 6 30	+60	—	—	—	—
II Toronto		30·6	52	—	—	(11 24)	-20	11·4	11·6
I Georgetown	E.	31·5	63	—	—	e 16 0	?L	19·6	—
II	N.	31·5	63	—	—	e 15 28	?L	e 18·0	—
I Washington		31·5	63	—	—	—	—	e 15·8	—
II		31·5	63	—	—	—	—	e 15·3	—
I Ithaca		32·4	58	—	—	—	—	e 16·0	—
I Ottawa		33·5	52	e 15 12	?L	—	—	19·4	—
II		33·5	52	i 16 21	?L	—	—	18·9	—
I Honolulu	E.	40·4	268	—	—	—	—	e 17·8	20·9
I	N.	40·4	268	—	—	—	—	e 17·6	18·8
I De Bilt		82·2	33	—	—	—	—	e 44·0	48·4

Additional readings : I Berkeley iN = +3m.45s. II Berkeley eE = +3m.11s.
I Georgetown eN = +15m.55s. II Georgetown eE = +15m.30s.
I Ottawa i = +16m.44s. II Ottawa eE = +16m.30s.

June 17d. Readings also at 19h. (near Algiers), 23h. (Helwan).

June 18d. Readings at 1h. (near Manila), 3h. (La Paz), 8h. (near Manila), 15h. (Kodaikanal and near Batavia), 23h. (near La Paz, Mizusawa, and near Tokyo).

June 19d. Readings at 0h. (near Colombo), 2h. (Rocca di Papa and Uccle), 4h. and 9h. (near Batavia), 12h. and 16h. (near Tokyo), 19h. (Taihoku), 23h. (La Paz).

June 20d. Readings at 0h. (Helwan, Uccle, De Bilt, and La Paz), 2h. (Kodaikanal), 13h. (Manila), 18h. (La Paz), 19h. (La Paz and Rio Tinto).

June 21d. Readings at 3h. (Edinburgh and near Mizusawa), 4h. (Colombo, Melbourne, and Taihoku), 7h. (near Rocca di Papa), 8h. (Tokyo), 10h. (Kodaikanal), 11h. (near Tokyo), 12h. and 13h. (Kodaikanal), 17h. (La Paz), 23h. (Nagasaki).

June 22d. 11h. 23m. 16s. Epicentre $43^{\circ}0'N. 142^{\circ}5'E.$

A = -·580, B = +·445, C = +·682 ; D = +·609, E = +·793 ;
G = -·541, H = +·415, K = -·731.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Hakodate		1·8	226	-0 1	-29	—	—	0·5	0·6
Ootomari		3·7	3	1 0	+ 2	—	—	1·4	—
Mizusawa	E.	4·0	195	1 0	- 2	1 47	- 3	—	—
Mito		6·8	194	1 39	- 5	(2 56)	- 9	2·9	—
Tyosi		7·4	190	1 54	+ 2	(3 10)	-11	3·2	4·3

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	7.6	197	1 36	-19	2 20	-66	3.6	4.8
Osaka	10.0	215	3 31	+61	—	—	5.2	6.2
Zi-ka-wei	20.5	242	e 4 47	0	e 8 35	+ 1	—	—
Hamburg	75.2	333	e 11 44	- 6	—	—	e 36.7	—
Eskdalemuir	77.4	341	12 3	0	e 21 52	- 1	40.7	—
Uccle	79.4	335	—	—	e 22 8	- 8	39.7	50.7
Strasbourg	80.2	331	e 12 13	- 7	—	—	45.7	—
Helwan	83.6	306	22 44	?S	(22 44)	-21	—	—

Additional readings and notes : Mizusawa gives also PN = +1m.2s. Osaka
 MN = +6.4m. Eskdalemuir eS has been corrected by +10m. Helwan
 PN = +23m.44s.

June 22d. Readings also at 6h. and 7h. (2) (La Paz), 17h. (Taihoku and La Paz),
 18h. and 19h. (Rio Tinto).

June 23d. 10h. 34m. 18s. I } Epicentre 28°-0N. 130°-0E.
 18h. 21m. 15s. II }

A = -568, B = +676, C = +470 ; D = +766, E = +643 ;
 G = -302, H = +360, K = -883.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Nagasaki	4.7	359	1 14	+ 1	(2 10)	+ 1	2.2	—
II Osaka	4.7	359	1 29	+16	(2 35)	+26	2.6	3.3
I Zi-ka-wei	8.1	33	3 47	?L	—	—	(3.8)	7.2
II	8.1	33	2 44	+41	—	—	5.3	6.9
I Taihoku	8.1	295	e 2 8	+ 5	—	—	—	4.3
II	8.1	295	e 2 0	- 3	e 3 40	0	—	6.5
I Tokyo	8.1	250	e 1 51	-12	—	—	—	—
II	8.1	250	e 2 12	+ 9	—	—	4.4	—
II Mizusawa	11.2	45	e 3 17	+30	e 4 32	-27	e 6.4	7.7
I Manila	14.4	37	3 43	+11	6 33	+15	—	—
II	15.9	214	—	—	—	—	e 6.7	—
II Ootomari	15.9	214	e 4 5	+14	—	—	7.2	—
II Budapest	21.1	25	5 1	+ 7	—	—	10.0	14.0
II Helwan	82.4	320	—	—	—	—	53.8	—
II Vienna	83.2	300	48 45	?L	—	—	(48.8)	—
II Hamburg	83.4	323	—	—	—	—	e 48.8	55.8
I De Bilt	83.4	329	—	—	—	—	e 43.8	47.8
II	86.6	329	—	—	—	—	e 47.7	50.2
II Strasbourg	86.6	329	—	—	e 23 20	-17	e 44.8	50.8
I Uccle	87.7	325	—	—	—	—	e 46.8	48.6
II	87.8	329	—	—	—	—	—	48.7
II Rocca di Papa	87.8	329	—	—	e 33 45	?	e 45.8	49.8
II Besançon	89.4	319	i 28 9	?SR ₁	—	—	e 48.2	50.8
II Oxford	89.5	324	—	—	—	—	47.8	—
II Moncalieri	89.6	331	—	—	—	—	47.7	51.4
II Tortosa	90.2	323	—	—	e 28 7	?SR ₁	40.8	—
II Coimbra	96.8	324	e 30 45	?SR ₁	—	—	50.8	55.5
II	101.6	328	e 20 40	?	—	—	51.8	56.7
II	101.6	328	e 16 40	?	30 10	?SR ₁	—	56.0

Additional readings and notes : II Nagasaki gives also MN = +3.4m. II Osaka
 MN = +7.2m. I Zi-ka-wei MN = +3.9m. II Zi-ka-wei MN = +4.2m.
 II Mizusawa PE = +3m.44s. II Helwan PN = +47m.45s. (?LN).
 II Hamburg MN = +48.6m. II De Bilt MN = +50.9m. II Rocca
 di Papa iP has been corrected by +1h.

June 23d. Readings also at 1h. (Zi-ka-wei (2)), 2h. (Uccle, Zi-ka-wei (2), and
 De Bilt), 6h. (near Zi-ka-wei), 7h. (De Bilt), 11h. and 13h. (Zi-ka-wei),
 14h. (Uccle, De Bilt, Zi-ka-wei, and Manila), 15h. (Manila, Zi-ka-wei,
 and La Paz), 16h. (De Bilt).

June 24d. Readings at 0h. (Manila), 4h. (Zi-ka-wei), 6h. (La Paz), 11h. and 19h.
 (Zi-ka-wei), 21h. (near Taihoku).

June 25d. 2h. 5m. 36s. Epicentre 49°-0N. 124°-0W. (as on 1919 Oct. 10d.).

A = -367, B = -544, C = +755; D = -829, E = +559;

G = -422, H = -626, K = -656.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria	0.8	141	—	—	—	—	-0.1	1.8
Berkeley	11.2	173	—	—	e 3 58	-61	e 5.4	9.3
Lick	12.1	171	—	—	—	—	e 5.6	8.6
Chicago	26.3	92	10 39	?S	(10 39)	+11	(16.1)	—
Toronto	30.8	82	—	—	e 11 24	-24	e 18.4	21.7
Ottawa	32.5	78	—	—	e 12 18	+ 2	e 18.0	—
Ithaca	33.2	82	—	—	e 19 12	?	22.8	—
Georgetown	34.7	89	—	—	e 10 16	-155	e 19.6	—
Washington	34.7	89	—	—	—	—	e 20.2	—
Cheltenham	34.9	89	—	—	—	—	i 19.9	23.1
Honolulu	38.6	236	10 16	?PR ₁	13 53	+ 7	14.7	17.8
Edinburgh	64.1	33	—	—	—	—	31.4	37.4
Eskdalemuir	64.6	32	—	—	e 19 14	- 6	30.4	—
Oxford	68.1	35	—	—	—	—	36.8	40.8
Kew	68.7	35	—	—	—	—	—	39.4
De Bilt	70.1	29	—	—	e 20 19	- 8	e 33.4	38.1
Uccle	70.9	31	—	—	e 20 24	-13	e 32.4	—
Paris	71.9	34	—	—	—	—	e 40.4	—
Moncalieri	77.0	32	—	—	e 21 53	+ 4	40.0	—
Tortosa	77.8	40	—	—	—	—	e 42.4	47.5

Additional readings: Toronto gives also eL = +20.8m. Ottawa L = +31.9m.
 Georgetown eLN = +19.4m., LE = +23.1m., LN = +22.4m. Cheltenham
 eE = +22m.55s., eN = +23m.3s., MN = +23.6m. Honolulu ME = +17.1m.
 Eskdalemuir eE = +26m.40s. De Bilt eLN = +35.4m.

June 25d. 15h. 31m. 6s. Epicentre 37°-5N. 134°-5E.

A = -556, B = +566, C = +609; D = +713, E = +701;

G = -427, H = +434, K = -793.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Osaka	2.9	165	0 48	+ 3	(1 22)	+ 2	1.4	1.8
Tokyo	4.8	113	e 2 22	?L	—	—	(e 2.4)	2.7
Mizusawa	5.4	71	1 23	0	2 29	+ 1	—	—
Manila	25.9	211	e 12 4	?S	(e 12 4)	+104	15.3	—
Batavia	50.7	217	—	—	i 15 45	-42	—	—

Additional readings: Mizusawa gives also SN = +2m.30s. Batavia i = +14m.13s., iE = +15m.42s.

June 25d. Readings also at 4h. (Helwan), 7h. (De Bilt and Taihoku), 11h. (Vienna, Rocca di Papa, De Bilt, Edinburgh, Hamburg, Helwan, Uccle, and Pompeii), 12h. (Kodaikanal and Eskdalemuir), 14h. (near Kobe), 15h. (Helwan and near Mizusawa), 20h. (La Paz and Rio Tinto).

June 26d. 3h. 40m. 38s. Epicentre 39°-3N. 21°-0E. (as on June 10d.).

A = +722, B = +277, C = +633; D = +358, E = -934;

G = +591, H = +227, K = -774.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2.6	120	1 6	+25	1 40	+28	1.8	2.0
Mostar	4.7	331	i 1 11	- 2	i 2 17	+ 8	—	3.0
Sarajevo	4.9	339	e 1 44	+28	2 39	+25	—	3.6
Pompeii	5.2	288	1 29	+ 9	2 51	?L	(2.8)	3.9
Sinj	5.5	326	1 47	+22	2 37	+ 6	—	3.3
Belgrade	5.5	356	1 29	+ 4	3 10	?L	(3.2)	3.6
Rocca di Papa	6.8	294	i 1 44	0	3 38	+33	—	4.5
Pola	7.6	319	e 1 56	+ 1	(e 3 12)	-14	3.2	5.2
Budapest	8.3	351	e 1 31	-35	e 4 45	?L	(4.8)	—
Florence	8.5	305	2 19	+10	—	—	—	6.5
Padova	9.1	315	2 21	+ 3	—	—	—	5.0

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Vienna	9.4	341	2 20	- 2	4 25	+12	i 5.4	6.6
Lemberg	10.7	11	—	—	e 4 46	- 2	e 5.7	6.5
Moncalieri	11.3	305	e 3 5	+16	5 42	+40	7.2	8.9
Zurich	12.1	316	e 2 54	- 6	e 5 15	- 6	—	—
Helwan	12.7	135	7 22	?L	—	—	(7.4)	—
Strasbourg	13.3	319	e 3 9	- 8	e 5 44	- 7	e 6.7	8.0
Besançon	13.4	311	5 25	?S	(5 25)	-28	(8.2)	10.4
Algiers	14.3	266	e 3 35	+ 5	e 6 23	+ 8	10.9	—
Tortosa	15.7	283	3 45	- 3	—	—	9.2	11.0
Hamburg	16.1	336	e 3 56	+ 3	—	—	8.4	11.6
Paris	16.2	312	e 3 57	+ 2	e 7 4	+ 4	9.4	9.4
Uccle	16.4	320	e 3 58	+ 1	e 6 58	- 6	8.6	10.5
De Bilt	16.8	325	4 10	+ 8	7 19	+ 6	8.4	11.7
Kew	19.1	315	—	—	—	—	—	15.4
Oxford	19.8	316	4 38	- 1	8 17	- 2	11.2	13.8
Coimbra	22.5	281	5 12	+ 1	9 13	- 2	e 12.2	14.3
Eskdalemuir	22.7	323	—	—	i 9 13	- 6	13.4	—
Edinburgh	23.0	324	—	—	9 22	- 3	—	17.9
Taihoku	31.9	64	14 58	?PR ₁	—	—	—	—

Additional readings and notes: Athens gives also $P = +1m.10s.$, $MN = +2.4m.$, $T_0 = 3h.40m.59s.$ Rocca di Papa $PR_1 = +2m.10s.$ Pola $MN = +4.7m.$
 Budapest readings are given as at 2h. Florence $P = +2m.12s.?$, $S = +7m.22s.?$ Vienna $eLN = +5.1m.$ Helwan $PN = +8m.22s.$ Hamburg $MNZ = +11.5m.$ De Bilt $MN = +11.2m.$

June 26d. Readings also at 2h. (Melbourne), 6h. (Taihoku), 10h. (Helwan and La Paz), 11h. (La Paz), 16h. (near Mizusawa (2) and Tokyo).

June 27d. Readings at 3h. (Helwan), 9h. (Taihoku), 22h. (near Mizusawa).

1921. June 28d. 13h. 58m. 48s. Epicentre $37^\circ OS.$ $175^\circ OE.$

$A = -.795$, $B = +.070$, $C = -.602$; $D = +.087$, $E = +.996$;
 $G = +.600$, $H = -.052$, $K = -.799$.

Very rough determination. Neither of the suggested origins (Riverview $39^\circ 8S.$, $177^\circ 4E.$, and Apia $40^\circ 0S.$, $178^\circ 0E.$) suit the observations.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Wellington	4.3	182	i 0 48	-19	—	—	—	1.2
Christchurch	6.7	195	1 12	-30	2 0	-62	—	4.2
Riverview	19.6	272	i 4 41	+ 5	i 8 33	+18	e 10.1	13.0
Sydney	19.6	272	(4 30)	- 6	(8 36)	+21	8.6	9.5
Melbourne	23.8	259	(5 18)	- 8	(8 0)	?	8.0	11.0
Apia	26.0	30	i 5 43	- 5	10 10	-12	12.6	—
Adelaide	29.3	263	e 6 12	- 9	i 11 12	-10	e 12.2	13.1
Perth	48.2	259	8 53	- 2	15 41	-15	—	—
Honolulu	N. 63.7	29	e 10 35	- 1	e 19 32	+23	—	—
Batavia	68.8	278	11 7	- 3	i 20 9	- 3	e 34.4	37.3
Manila	72.4	306	e 11 34	+ 2	(20 56)	+ 1	20.9	21.1
Tokyo	79.8	332	e 11 32	-46	—	—	—	—
Mizusawa	E. 82.2	335	12 28	- 3	15 44	?PR ₁	—	—
	N. 82.2	335	12 23	- 8	15 28	?PR ₁	—	—
Berkeley	94.6	45	—	—	e 24 16	-46	—	—
Colombo	98.2	273	26 12	?S	(26 12)	+34	—	28.2
La Paz	100.1	120	14 8	- 3	i 24 35	-82	47.8	57.1
Victoria	101.5	37	17 45	?PR ₁	26 7	- 3	36.9	51.7
Kodaikanal	102.1	275	26 6	?S	(26 6)	-10	62.0	68.1
Chicago	118.6	58	19 50	?PR ₁	29 47	+68	55.9	—
Georgetown	E. 124.8	66	—	—	—	—	e 71.2	—
Toronto	124.9	59	—	—	e 38 12	?SR ₁	55.2	—
Ottawa	127.9	58	e 18 57	[-17]	—	—	56.2	—
Helwan	149.0	270	21 12	?PR ₁	(26 12)	?	—	—
Budapest	159.5	308	e 24 12	?PR ₁	—	—	—	—
Hamburg	160.5	333	e 19 53	[-15]	—	—	e 76.2	83.2

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S m. s.	O-C. s.	L. m.	M. m.
Vienna	160.8	313	i 19 53	[-16]	e 35 12	?	e 55.2	93.2
Edinburgh	161.1	357	e 20 48	[+39]	—	—	—	52.0
Eskdalemuir	161.7	357	19 53	[-16]	—	—	—	81.9
Stonyhurst	163.1	355	20 24	[+14]	—	—	—	47.2
De Bilt	163.3	338	e 20 57	[+47]	—	—	e 70.2	88.0
Pompeii	E. 164.4	290	20 12	[+1]	26 12	?PR ₁	—	—
Uccle	164.7	337	e 20 5	[-7]	e 35 6	?	—	—
Oxford	165.0	351	—	—	i 34 12	—	—	89.7
Strasbourg	165.2	325	21 4	[+52]	e 24 52	?PR ₁	e 78.2	—
Kew	165.2	348	—	—	—	—	—	59.2
Rocca di Papa	165.5	295	e 19 42	[-30]	—	—	—	50.5
Paris	167.0	338	i 20 0	[-13]	—	—	73.2	81.2
Besançon	167.0	325	19 52?	[-21]	—	—	—	—
Moncalieri	167.6	314	19 50	[-24]	29 0	?	53.5	—
Barcelona	172.9	311	—	—	31 21	?	—	45.2
Algiers	173.5	271	20 5	[-11]	29 49	?	e 42.2	93.2
Tortosa	174.3	314	20 3	[-13]	31 32	?	54.9	93.3
Coimbra	175.9	38	21 39	[+82]	32 33	?	e 76.2	—
Rio Tinto	178.6	59	25 12	?PR ₁	—	—	(82.2)	105.2
Granada	178.8	279	21 13	[+56]	i 33 28	?	—	—

Additional readings and notes: Christchurch gives also PR₁ = +1m.36s.
 Riverview i = +4m.46s., +4m.53s., and +4m.56s., PR₁ = +5m.7s., PR₂ = +5m.23s., PR₃ = +5m.35s., PR₄ = +5m.44s., PS = +8m.50s., SR₁ = +9m.16s., SR₂ = +9m.34s., MZ = +13.2m., MN = +14.6m., T₀ = +13h.58m.29s.
 Epicentre 39° 8'S, 177° 4'E. Melbourne P = +0m.30s., SR₁ = +5m.54s.
 Adelaide i = +6m.42s., +7m.12s., +7m.42s., +10m.48s., i = +14m.6s., +15m.12s., and +16m.24s. Batavia i = +12m.20s. and +20m.54s.
 Manila S = +17m.10s., MN = +21.0m. La Paz i = +18m.6s., T₀ = 14h.0m.26s.
 Georgetown eLN = +71.8m., both these readings increased by 1h. Toronto e = +41m.12s., L = +66.0m. Ottawa iNV = +21m.1s., iV = +22m.1s., eL? = +30.9m. Budapest gives its readings as at 4h. instead of 14h. Hamburg iZ = +20m.43s., MN = +86.2m.
 Vienna iZ = +20m.44s. and +24m.33s. Eskdalemuir iZ = +20m.46s. = eN, PR₁? = +24m.27s. De Bilt ePR₁ = +24m.43s., MN = +94.6m.
 Uccle PR₁ = +24m.47s. Rocca di Papa iE = +20m.0s. (O-C. = -12s.), ePV = +20m.16s., P = +20m.6s. Paris PR₁ = +25m.1s. Coimbra eL = +46m.12s. (?SR₁), T₀ = 14h.7m.30s.

June 28d. Readings also at 12h. (Helwan), 17h. and 22h. (La Paz).

June 29d. 11h. 37m. 50s. Epicentre 43° 0'N. 44° 0'E.

A = +.526, B = +.508, C = +.682; D = +.695, E = -.719;
 G = +.491, H = +.474, K = -.731.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Lemberg	15.3	303	i 6 41	?S	(i 6 41)	+ 2	(e 9.5)	10.2
Helwan	16.6	222	7 10	?S	(7 10)	+ 1	(10.2)	—
Belgrade	17.0	284	4 9	+ 4	9 22	?L	e 11.5	11.9
Budapest	18.0	293	—	—	e 9 49	?L	e 11.7	—
Vienna	19.9	295	4 42	+ 2	i 8 23	+ 2	i 11.0	12.2
Pola	21.6	285	e 8 25	?S	(e 8 25)	-32	e 12.5	18.1
Rocca di Papa	23.0	278	e 5 16	- 1	9 22	- 3	16.0	16.2
Hamburg	24.7	307	e 5 33	- 2	e 9 48	- 9	e 13.0	14.6
Zurich	25.1	292	e 5 37	- 2	—	—	—	—
Strasbourg	25.6	295	e 5 40	- 4	e 10 10	- 4	e 13.7	—
Moncalieri	26.0	287	e 6 26	+38	10 19	- 3	e 13.7	—
Besançon	26.9	292	14 45	?L	—	—	(14.8)	17.2
De Bilt	E. 27.4	303	e 6 0	- 2	e 10 46	- 2	14.6	16.9
	N. 27.4	303	—	—	—	—	13.8	16.8
Uccle	27.8	300	e 6 3	- 3	e 10 52	- 3	e 13.2	—
Paris	29.1	296	—	—	—	—	e 15.7	20.2
Edinburgh	32.5	310	—	—	—	—	e 14.2	24.2
Eskdalemuir	32.5	309	—	—	e 10 53	-83	15.7	21.2
Coimbra	38.7	284	e 6 30	-74	—	—	e 21.2	—

Additional readings: Pola gives also MN = +16.6m. Rocca di Papa e = +5m.28s. Hamburg MZ = +14.3m., MN = +17.3m. Paris MN = +15.2m.

June 29d. Readings also at 4h. (Manila), 6h., 15h., and 16h. (La Paz), 18h. (Manila), 20h. (near Pompeii and Rocca di Papa), 23h. (Stonyhurst, Edinburgh, De Bilt, and near Port au Prince).

June 30d. 2h. 10m. 3s. Epicentre $61^{\circ}5N$. $33^{\circ}5W$.

A = +398, B = -263, C = +879; D = -552, E = -834;
G = +733, H = -485, K = -477.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Dyce	N.	16.4	91	—	—	—	—	—	9.0
Edinburgh		16.5	96	4 7	+ 8	7 21	+14	8.6	10.8
Eskdalemuir		16.8	98	4 6	+ 4	7 21	+ 8	8.4	10.2
Stonyhurst		18.0	100	e 4 27	+10	—	—	—	10.8
Oxford		19.9	104	i 4 37	- 3	—	—	9.4	14.2
Kew		20.6	104	—	—	—	—	—	12.0
De Bilt		22.7	97	5 17	+ 4	9 25	+ 6	11.0	14.1
Uccle		23.2	100	e 5 14	- 5	9 25	- 4	11.0	13.3
Paris		23.7	106	e 5 20	- 5	e 9 36	- 2	12.0	14.0
Hamburg		24.1	89	i 5 35	+ 6	e 10 1	+15	e 14.2	17.8
Coimbra		26.2	133	5 31	-19	9 49	-37	11.7	12.1
Strasbourg		26.3	100	5 49	- 2	e 10 30	+ 2	e 14.6	15.4
Besançon		26.3	104	5 56	+ 5	10 24	- 4	14.0	—
Moncalieri		28.9	106	e 6 14	- 3	11 17	+ 2	14.2	—
Ottawa		29.1	256	6 19	0	11 16	- 3	e 14.4	—
Tortosa		29.1	119	6 5	-14	10 45	-34	14.0	18.9
Vienna		30.6	92	e 6 30	- 4	e 10 45	-59	e 15.2	20.8
Granada		30.6	129	7 27	+53	i 16 52	?L (i 16.9)	—	—
Pola		31.9	99	e 14 57?	?L	—	— (e 15.0?)	—	—
Toronto		32.1	258	5 51	-57	10 39	-91	i 18.4	18.8
Budapest		32.5	91	—	—	—	—	e 16.0	20.0
Rocca di Papa		33.7	104	—	—	(e 12 15)	-21	19.8	23.0
Chicago		37.5	264	7 39	+ 5	13 27	- 4	18.4	—
Helwan		52.1	96	16 57	?S	(16 57)	+12	(32.0)	—

Additional readings: De Bilt gives also MN = +15.0m. Epicentre $54^{\circ}5N$.
 $32^{\circ}5W$. Uccle MN = +12.9m. Hamburg MN = +16.4m., MZ =
+15.8m. Readings all given as on 29d. Coimbra MN = +13.0m., T_0 =
2h.8m.1s. Ottawa eLN = +15.4m., LE = +21.4m., T_0 = 2h.10m.8s.
Rocca di Papa gives S as eL.

June 30d. Readings also at 3h. (Simla), 8h. (Moncalieri, Strasbourg, Paris, Uccle, and De Bilt), 13h. (near Mizusawa), 14h. (near Athens), 16h. (Coimbra), 23h. (near Rocca di Papa).

TABLE.

De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.
1	15	28	13	51	553	991	438	101	855	1565	710
2	31	55	24	52	560	1004	444	102	860	1575	715
3	47	83	36	53	566	1016	450	103	865	1584	719
4	62	110	48	54	573	1029	456	104	870	1593	723
5	77	137	60	55	579	1041	462	105	874	1602	728
6	92	164	72	56	586	1054	468	106	879	1612	733
7	106	190	84	57	592	1066	474	107	884	1621	737
8	121	217	96	58	599	1079	480	108	888	1630	742
9	136	243	107	59	605	1091	486	109	893	1639	746
10	150	269	119	60	612	1103	491	110	897	1648	751
11	164	294	130	61	619	1116	497	111	902	1657	755
12	179	319	140	62	625	1128	503	112	907	1666	759
13	193	344	151	63	632	1141	509	113	911	1674	763
14	206	368	162	64	638	1153	515	114	916	1682	766
15	219	392	173	65	645	1165	520	115	920	1690	770
16	232	415	183	66	651	1177	526	116	925	1698	773
17	245	438	193	67	658	1190	532	117	929	1706	777
18	257	460	203	68	664	1202	538	118	934	1714	780
19	269	482	213	69	671	1214	543	119	938	1722	784
20	281	503	222	70	677	1226	549	120	942	1729	787
21	293	524	231	71	683	1238	555	121	947	1737	790
22	305	545	240	72	690	1250	560	122	952	1744	792
23	317	565	248	73	696	1262	566	123	957	1752	795
24	328	584	256	74	702	1274	572	124	961	1759	798
25	338	603	265	75	709	1286	577	125	966	1766	800
26	348	622	274	76	715	1297	582	126	970	1773	803
27	358	641	283	77	721	1309	588	127	974	1780	806
28	368	659	291	78	727	1320	593	128	978	1787	809
29	378	677	299	79	733	1332	599	129	983	1794	811
30	388	694	306	80	739	1343	604	130	988	1801	813
31	398	711	313	81	745	1355	610	131	992	1807	815
32	407	728	321	82	750	1366	616	132	996	1814	818
33	416	744	328	83	756	1377	621	133	1001	1821	820
34	425	760	335	84	762	1388	626	134	1005	1827	822
35	433	775	342	85	768	1399	631	135	1009	1833	824
36	442	790	348	86	773	1410	637	136	1014	1840	826
37	450	804	354	87	779	1421	642	137	1018	1846	828
38	458	818	360	88	785	1432	647	138	1023	1852	829
39	466	832	366	89	790	1443	653	139	1027	1858	831
40	475	847	372	90	796	1454	658	140	1031	1864	833
41	483	861	378	91	801	1464	663	141	1035	1869	834
42	491	875	384	92	807	1475	668	142	1039	1875	836
43	498	888	390	93	812	1485	673	143	1043	1881	838
44	506	902	396	94	818	1496	678	144	1047	1886	839
45	513	915	402	95	823	1506	683	145	1051	1892	841
46	520	928	408	96	829	1516	687	146	1055	1897	842
47	527	941	414	97	834	1526	692	147	1059	1902	843
48	534	954	420	98	840	1536	696	148	1063	1907	844
49	540	966	426	99	845	1546	701	149	1067	1912	845
50	547	979	432	100	851	1556	705	150	1071	1917	846

The International Seismological Summary for 1921 July, August, September.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number of the Summary deals with 62 epicentres, 26 of which are new and 36 repetitions from old epicentres. The corresponding figures for former periods are :

	New	Old
1913-1920 March	597	550
1920 April—June	27	48
July—Sept.	31	49
Nov.—Dec.	27	42
1921 Jan.—Mar.	31	30
Apr.—June	29	36
July—Sept.	26	36

These figures thus show great steadiness. Certain periodicities which undoubtedly exist apply therefore, not to the earth as a whole, but to localities. Of this there is ample confirmation, as will appear from special investigations now in hand.

There are only two cases of presumed abnormal focal depth :

July 15d. 18h. $2^{\circ}1\text{N}$. $127^{\circ}8\text{E}$. Depth $+0.030$

Sept. 20d. 20h. $1^{\circ}5\text{S}$. $109^{\circ}3\text{E}$. Depth $+0.050?$

In the case of July 15 the evidence from antipodal stations is not strong, and on 1920 Jan. 26 there is no evidence of abnormal depth for this focus, though it must be admitted that the observations were few. The evidence on Sept. 20 is slighter still ; but the cases are worthy of notice along with others.

On Sept. 19d. 23h. a solution is printed which suits the stations near the epicentre, but gives large *positive* residuals for [P] at antipodal stations : for which at present no explanation is offered.

Acknowledgment should be made of the valuable help afforded by the *Seismological Bulletin of the Central Meteorological Observatory of Japan*, from which many readings have been obtained which were not communicated by the individual observatories, *e.g.* Akita, Gihu, Hakodate, Hukuoka, Kagosima, Kyoto, Maebasi, Matuyama, Mito, Nagano, Niigata, Numadu, Tuku-basan, Tyosi, and Zinsen. But it would be more helpful still if we could have these readings direct.

Those observers who have not already communicated their readings for 1921 and 1922 are urgently requested to send them without delay to the University Observatory, Oxford.

H. H. TURNER.

University Observatory, Oxford,
1925 July 31.

1921 JULY, AUGUST, & SEPTEMBER.

July 1d. Readings at 5h. (near Tacubaya), 11h. (Vienna and near Belgrade, Mostar, and Sarajevo), 12h. (near Oaxaca and Tacubaya), 17h. (near Nagasaki), 19h. (near Mizusawa).

July 2d. Readings at 1h. (Manila and near Batavia), 8h. (Manila (2)), 14h. (near Mizusawa), 19h. (near Rocca di Papa), 21h. (near Osaka).

July 3d. 5h. 2m. 40s. Epicentre $16^{\circ}5'S$. $180^{\circ}0'$ (as on 1919 Oct. 19d.).

A = -·959, B = ·000, C = -·284; D = ·000, E = +1·000;
G = +·284, H = ·000, K = -·959.

(Evidence conflicting; perhaps at $27^{\circ}0'S$. $172^{\circ}0'W$., as on 1918 Jan. 13d.)

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	8·4	73	e 2 24	+17	—	—	3·8	5·8
Christchurch	27·8	191	—	—	10 56	+ 1	16·7	20·8
Riverview	31·2	230	e 6 50	+10	(e 12 56)	+62	e 12·9	15·3
Melbourne	37·4	229	7 32	- 1	12 26	-64	e 16·1	20·8
Honolulu	E. 43·5	31	14 30	?S	(14 30)	-25	18·6	20·0
	N. 43·5	31	—	—	—	—	18·8	21·1
Manila	66·1	295	e 11 20	+28	—	—	—	—
Victoria	82·1	35	—	—	—	—	37·8	41·7
Toronto	108·9	48	—	—	—	—	60·0	60·7
Edinburgh	140·5	2	—	—	—	—	73·3	—
De Bilt	E. 144·2	354	—	—	e 41 19	?SR ₁	e 70·3	85·4
Uccle	145·5	356	e 19 20	[-29]	—	—	e 59·3	85·3
Strasbourg	147·3	349	e 19 25	[-27]	—	—	—	—

Additional readings: Apia gives also LN = +3·9m. Algiers ($\Delta = 159^{\circ}5'$, Az. = $353^{\circ}0'$) gives simply 5h. De Bilt MN = +87·4m.

July 3d. 14h. 52m. 50s. Epicentre $29^{\circ}0'N$. $130^{\circ}0'E$.

A = -·562, B = +·670, C = +·485; D = +·766, E = +·643;
G = -·312, H = +·371, K = -·875.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagasaki	3·7	358	1 40	?S	(1 40)	- 2	2·8	—
Osaka	7·3	38	—	—	3 9	- 9	—	13·4
Zi-ka-wei	z. 7·7	289	1 57	0	3 27	- 2	—	5·3
Taihoku	8·5	244	e 1 53	-16	(3 23)	-27	3·4	—
Manila	16·7	212	e 3 59	- 2	—	—	6·7	6·7
Budapest	81·9	321	—	—	—	—	e 47·2	—
Hamburg	82·5	329	i 12 36	+ 3	e 22 58	+ 6	e 51·2	54·2
Vienna	82·6	323	i 12 35	+ 1	e 23 4	+11	e 42·2	53·2
Helwan	82·7	300	23 10	?S	(23 10)	+16	(52·2)	—
De Bilt	85·6	329	12 55	+ 4	23 25	- 1	e 46·2	56·4
Edinburgh	86·2	336	—	—	—	—	46·2	—
Eskdalemuir N.	86·7	336	—	—	e 23 22	-16	46·2	56·9
Uccle	86·9	329	e 12 56	- 2	e 23 35	- 5	e 42·2	—
Strasbourg	86·9	325	e 12 55	- 3	—	—	e 47·2	56·2
Oxford	88·6	331	—	—	—	—	46·3	59·9
Rocca di Papa	88·6	319	i 9 19	?	—	—	e 56·2	66·2
Paris	89·2	329	—	—	e 22 37	-88	50·2	59·2
Moncalieri	89·3	323	—	—	22 16	-110	50·1	—
Coimbra	101·0	329	e 13 46	-29	e 25 14	-51	e 55·2	—
Rio Tinto	101·9	326	59 10	?L	—	—	(59·2)	66·2

Additional readings: Osaka gives also MN = +12·7m. Zi-ka-wei P = +1m.55s., MN = +4·8m., ME = +5·0m. Hamburg e = +46m.10s.
Helwan gives its readings as PE and PN.

July 3d. Readings also at 2h. (Helwan), 4h. (near Kobe and near Mizusawa), 9h. (La Paz), 10h. (Sydney), 11h. (Pompeii), 14h. (near Batavia), 16h. (Pompeii), 19h. (Rio Tinto), 22h. (La Paz and Moncalieri).

July 4d. 14h. 18m. 0s. Epicentre $25^{\circ}0'N$. $141^{\circ}5'E$. (as on 1919 April 27d.).

A = -·709, B = +·564, C = +·423; D = +·622, E = +·783;
G = -·331, H = +·263, K = -·906.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tyosi	10·7	357	2 39	- 1	(4 25)	-23	4·4	4·6
Osaka	11·0	333	2 56	+12	(4 58)	+ 4	5·0	5·4
Kobe	11·1	332	2 44	- 2	(4 43)	-14	4·7	4·8
Mito	11·4	356	2 42	- 8	(4 22)	-42	4·4	5·0
Nagasaki	12·8	310	3 13	+ 3	(5 28)	-11	5·5	5·6
Hukuoka	12·9	313	3 3	- 9	(5 12)	-30	5·2	5·6
Hakodate	16·8	358	3 30	-32	5 30	-103	—	—
Taihoku	18·1	274	4 12	- 6	(7 23)	-19	7·4	—
Zi-ka-wei	18·7	294	e 4 20	- 5	e 7 38	-17	—	—
Manila	21·9	246	e 4 55	- 9	7 58	-65	8·8	9·4
Riverview	59·6	171	e 10 3	- 6	i 18 4	-14	e 27·1	31·5
Adelaide	60·0	183	—	—	i 18 12	-11	e 29·2	32·1

Additional readings: Hukuoka gives also MN = +5·7m. Zi-ka-wei gives also eSN = +7m.41s., PSE = +7m.46s., PSN = +7m.54s. Riverview iS = +18m.11s., MN = +30·0m. Adelaide e = +25m.6s. and +26m.42s.

July 4d. 14h. 18m. 0s. Epicentre $29^{\circ}0'N$. $130^{\circ}0'E$. (as on July 3d.).

A = -·562, B = +·670, C = +·485; D = +·766, E = +·643;
G = -·312, H = +·371, K = -·875.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Mizusawa	E. 13·7	39	3 20	- 2	5 58	- 3	—	—
	N. 13·7	39	3 21	- 1	6 4	+ 3	—	—
Ootomari	20·3	26	4 48	+ 3	(8 32)	+ 3	8·5	8·8
Batavia	41·7	217	i 7 59	-10	i 14 27	- 4	—	—
Simla	45·3	286	—	—	e 16 54	+95	—	—
Honolulu	64·7	79	—	—	22 11	?SR ₁	29·8	32·1
Lemberg	77·6	320	e 13 6	+61	—	—	—	23·1
Victoria	78·7	40	—	—	(20 4)	-124	20·1	22·5
Budapest	81·9	321	e 12 30	0	e 22 58	+13	e 38·0	49·0
Belgrade	82·3	318	23 12	?S	(23 12)	+23	—	—
Hamburg	82·5	329	e 16 36	?PR ₁	i 23 13	+21	e 47·2	48·0
Vienna	82·6	323	13 32	+58	i 23 20	+27	e 49·0	58·0
Helwan	E. 82·7	300	24 0	?S	(24 0)	+66	—	—
De Bilt	E. 85·6	329	e 12 56	+ 5	i 23 32	+ 6	e 49·0	54·4
	N. 85·6	329	e 13 2	+11	—	—	—	52·6
Pola	86·0	320	e 23 37	?S	(e 23 37)	+ 7	e 49·0	51·3
Edinburgh	86·2	336	—	—	i 23 27	- 5	—	50·0
Eskdalemuir	86·7	336	13 17	+20	23 32	- 6	44·0	52·6
Padova	86·8	322	23 55	?S	(23 55)	+16	—	—
Strasbourg	86·9	325	e 13 26	+28	e 23 39	- 1	e 49·0	55·8
Uccle	86·9	329	—	—	23 37	- 3	e 45·0	51·0
Stonyhurst	87·5	333	e 23 18	?S	(e 23 18)	-29	—	—
Pompeii	E. 88·1	317	24 0	?S	(24 0)	+ 7	—	—
Oxford	88·6	331	—	—	i 23 42	-17	50·7	54·7
Rocca di Papa	88·6	319	—	—	23 54	- 5	—	—
Besançon	88·7	325	—	—	23 49	-11	—	—
Paris	89·2	329	—	—	e 23 51	-14	51·0	53·0
Moncalieri	89·3	323	e 21 52	?	i 23 52	-14	39·6	—
Tortosa	95·9	324	24 20	?S	(24 20)	-55	e 56·0	58·3
Algiers	97·5	320	—	—	i 24 32	-59	58·0	—
Coimbra	101·0	329	e 12 5	-130	e 27 0	+55	e 45·8	—
Chicago	101·2	27	i 23 51	?S	31 15	?SR ₁	40·2	—
Rio Tinto	101·9	326	57 0	?L	—	—	(57·0)	66·0
Ottawa	102·0	18	—	—	e 26 48	+33	41·0	—
Georgetown	107·6	21	e 17 45	?	23 37	?	—	—
La Paz	159·2	57	19 51	[-16]	i 30 9	?	—	—

For Notes see next page.

NOTES TO JULY 4d. 14h. 18m. 0s.

Additional readings: Ootomari gives also MN = +8.6m. Batavia i = +9m.47s. Honolulu PR₁ = +7m.16s., iN = +9m.12s., MN = +23.4m. Belgrade eP = +25m.45s., eSR₁ = +28m.1s. Helwan PN = +25m.0s. De Bilt PR₁ = +17m.2s. Eskdalemuir PR₁ = +17m.7s., SR₁ = +30m.35s. Padova +24m.2s. and +25m.50s. Strasbourg MN = +55.5m. Uccle ePR₁ = +17m.6s. Rocca di Papa e = +21m.42s. Paris MN = +58.0m. Moncalieri S is given as simply i, also S = +31m.57s. Algiers e = +18m.36s. and +33m.20s. Coimbra SN = +24m.47s. Chicago i = +24m.49s., PR₁ = +26m.15s. Ottawa i = +24m.11s. and +24m.48s., eLE = +37.0m. Georgetown SN = +23m.36s.

July 4d. Readings also at 9h. (Toronto), 12h. (Vienna and Budapest), 14h. (Mizusawa), 23h. (La Paz).

July 5d. 17h. 8m. 10s. Epicentre 42°·4N. 11°·1E. (as on 1917 July 8d.).

A = +.725, B = +.142, C = +.674.

		△	P.	O - C.	S.	O - C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa		1.3	e 0 38	+18	e 0 56	+20	(e 0.9)	2.3
Florence		1.4	1 10	?L	—	—	(1.2)	1.3
Padova		3.1	0 55	+6	1 25	-1	—	2.0
Pola		3.2	—	—	e 1 25	-3	e 1.8	2.4
Moncalieri		3.5	e 0 57	+2	1 29	-8	—	2.1
Zurich	E.	5.3	e 1 14	-8	i 2 5	-20	—	2.2
	N.	5.3	e 1 29	+7	i 2 4	-21	—	2.2
Besançon		6.1	2 10?	+37	2 39	-7	—	—
Strasbourg		6.6	e 1 44	+3	e 2 46	-14	—	—
Vienna		6.9	e 2 38	+53	—	—	—	3.7
Paris		8.8	—	—	—	—	e 4.2	5.8
De Bilt		10.5	—	—	e 4 50	+7	—	6.5
Hamburg		11.2	—	—	—	—	e 5.6	5.9

Additional readings Florence gives others sets of P and M. Padova +0m.59s., +1m.6s. Pola MN = +2m.0s. Zurich eE = +1m.18s., eV = +1m.20s. De Bilt MN = +6.4m.

July 5d. Readings also at 1h. (Manila), 5h. (La Paz), 10h. (Perth), 11h. (Helwan), 12h. (Rocca di Papa and Riverview), 13h. (Tortosa), 15h. (La Paz), 16h. (Helwan), 19h. (Manila), 20h. (Riverview).

July 6d. Readings at 3h. (near Osaka and Mizusawa), 5h. (La Paz), 12h. (near Tokyo and near Osaka and Kobe).

July 7d. 10h. 33m. 7s. Epicentre 47°·0S. 78°·0W.

A = +.142, B = -.667, C = -.731; D = -.978, E = -.208;
G = -.152, H = +.715, K = -.682.

This origin is very doubtful. No doubt the following shock obliterated the Australian records.

	△	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	31.6	18	i 6 43	0	i 12 0	-1	16.4	20.9
Wellington	70.6	230	—	—	e 21 5	+32	e 27.7	29.9
Chicago	89.1	354	—	—	e 23 58	-6	e 39.0	—
Ottawa	92.4	2	—	—	e 24 0	-39	e 37.9	—
Rio Tinto	106.0	50	51 53	?L	—	—	(51.9)	66.9
Algiers	110.7	58	e 19 57	?PR ₁	—	—	e 56.9	66.4
Paris	118.4	47	e 20 12	?PR ₁	e 32 19	?SR ₁	54.9	77.9
Moncalieri	118.7	53	—	—	e 29 59	+79	57.3	—
Kew	118.8	43	—	—	—	—	—	73.9
Besançon	119.2	50	—	—	—	—	71.9	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s	s.	m.	m.
Stonyhurst	119.4	41	e 54 53	?L	—	—	(e 54.9)	67.9
Rocca di Papa	119.5	59	e 16 8	+28	—	—	e 35.0	49.7
Eskdalemuir	120.0	38	e 20 18	?PR ₁	e 30 12	+83	52.9	66.0
Edinburgh	120.4	38	e 22 53	?	—	—	—	66.9
Uccle	120.6	46	e 20 17	?PR ₁	e 30 17	+83	e 50.9	64.9
Strasbourg	121.0	50	e 20 24	?PR ₁	e 32 10	?	e 54.9	69.9
De Bilt	121.8	45	e 20 37	?PR ₁	e 30 20	+77	e 59.9	64.0
Hamburg	125.0	45	e 20 56	?PR ₁	—	—	e 61.9	79.9
Budapest	126.6	55	—	—	—	—	50.9	—
Kodaikanal	137.8	142	70 17	?L	—	—	(70.3)	—
Manila	144.0	213	e 19 53	[+ 6]	—	—	29.6	—

Additional readings: Chicago gives also L = +67.9m. Ottawa LE = +53.9m., +78.4m., and +89.4m. Eskdalemuir eN = +35m.43s. Uccle MN = +67.9m. De Bilt ePR₁ = +26m.7s., MN = +73.5m.

July 7d. 10h. 45m. 50s. Epicentre 12°.2S. 164°.7E.

A = -.943, B = +.258, C = -.211; D = +.264, E = +.965;
G = +.204, H = -.056, K = -.977.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	24.9	207	e 5 37	0	e 10 1	0	e 13.0	15.5
Melbourne	31.1	211	6 46	+ 7	11 58	+ 5	15.0	21.7
Adelaide	32.8	222	e 6 46	- 9	e 12 10	-11	e 15.2	22.9
Batavia	57.3	270	e 9 54	0	e 13 38	?PR ₁	—	—
Victoria	87.0	39	—	—	—	—	40.8	45.2
Toronto	117.0	46	—	—	—	—	52.3	—
Helwan	E. 133.4	300	21 10	?PR ₁	—	—	—	—
Vienna	135.3	330	e 19 10	[-21]	—	—	—	87.5

Additional readings: Riverview eS = +10m.25s., MN = +16.0m., MZ = +18.6m. Adelaide e = +19m. 40s. Toronto L? = +47.9m.

July 7d. Readings also at 1h. (near Mizusawa), 5h. (Sydney), 8h. (Helwan), 9h. (near Tokyo), 11h. (Christchurch and Honolulu, possibly connected with one of the above shocks, but given as independent shocks), 12h. (Rio Tinto and La Paz), 16h. (2) and 17h. (Taihoku), 20h. (Manila), 23h. (Wellington).

July 8d. 10h. 48m. 48s. Epicentre 20°.0N. 78°.0W.

A = +.195, B = -.919, C = +.342; D = -.978, E = -.208;
G = +.071, H = -.335, K = -.940.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Kingston	2.4	151	—	—	—	—	1.2	—
Georgetown	18.9	2	e 7 12	?S	9 35	?L	e 12.2	—
Washington	18.9	2	—	—	e 7 42	-18	12.2	—
Ithaca	22.5	3	—	—	e 9 24	+ 9	14.6	—
Chicago	23.2	342	5 19	0	9 29	0	11.9	—
Ottawa	25.4	4	e 5 39	- 3	e 10 2	- 9	e 13.8	—
La Paz	37.8	164	7 32	- 4	16 22	?	26.2	—
De Bilt	E. 70.2	40	—	—	—	—	e 35.2	45.6
	N. 70.2	40	—	—	—	—	e 30.2	33.2
Helwan	95.7	55	63 12	?L	—	—	(63.2)	—

Additional readings: Georgetown gives also eLN? = +12.3m. Ithaca e = +13m.18s. Ottawa L = +14.7m.

July 8d. Readings also at 1h. (La Paz (2)), 2h. (Helwan), 3h. (Rio Tinto), 6h. (near La Paz), 13h. (Kodaikanal, La Paz (2), Riverview, Melbourne, Manila, and near Batavia), 14h. (Manila, Helwan, and De Bilt), 19h. (Manila and near Taihoku), 20h. (De Bilt), 21h. (Melbourne), 23h. (Hokoto and near Algiers (2)).

July 9d. Readings at 0h. (Wellington), 7h. (Kingston, Chicago, Tacubaya, Georgetown, Washington, and Ottawa), 16h. (Manila), 20h. and 21h. (2) (near Batavia).

July 10d. Readings at 0h. (Melbourne), 1h. (Riverview, Manila, and Adelaide), 2h. (Chicago, Honolulu, La Paz, Uccle, De Bilt, and Ottawa), 3h. (Helwan, Paris, and Rio Tinto), 7h. (Honolulu), 13h. (Nagasaki), 14h. (Helwan), 15h. (Nagasaki), 17h. (La Paz), 18h. (Helwan and La Paz (3)), 19h. (La Paz), 21h. (3) and 22h. (La Paz).

July 11d. Readings at 6h. (Manila), 16h. (Stonyhurst), 18h. (near Mizusawa), 20h. (near Tokyo and near Mizusawa).

July 12d. Readings at 3h. (Manila), 5h. (La Paz), 10h. (Manila), 13h. (Stonyhurst, Manila, Colombo, and Zi-ka-wei), 14h. (Helwan), 17h. (near Tokyo), 20h. (Ottawa, Berkeley, Chicago, Georgetown, and Tucson).

July 13d. 10h. 16m. 24s. Epicentre $34^{\circ}0S$. $8^{\circ}0W$.

$$A = +.821, B = -.115, C = -.559; \quad D = -.139, E = -.990; \\ G = -.554, H = +.078, K = -.829.$$

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Cape Town	21.9	97	11 43	?L	—	—	(11.7)	20.9
La Paz	56.3	273	9 47	-1	16 6	-92	21.4	31.0
Rio Tinto	71.7	1	25 36	?SR ₁	—	—	—	38.6
Algiers	72.1	10	—	—	—	—	36.6	—
Helwan E.	73.9	36	—	—	21 36	+23	—	—
Coimbra E.	74.2	0	14 49	?PR ₁	25 7	?SR ₁	34.8	—
Rocca di Papa	78.1	16	i 12 8	0	—	e 38.7	—	42.4
Paris	83.4	7	—	—	e 20 36	-145	40.6	42.6
Strasbourg	83.7	11	e 12 42	+ 2	—	—	—	—
Vienna	85.1	16	e 12 50	+ 1	—	—	e 44.6	49.6
Uccle	85.5	9	e 12 36	-15	e 23 30	+ 5	e 35.6	—
Kew	85.7	5	—	—	—	—	—	44.6
De Bilt	86.9	9	e 15 18	?PR ₁	e 23 25	-15	e 36.6	43.7
Hamburg	89.0	10	e 13 12	+ 2	e 24 6	+ 3	e 44.6	—
Eskdalemuir	89.4	3	e 13 1	-11	e 23 55	-12	38.6	—
Edinburgh	90.0	3	—	—	23 36	-38	—	—
Ottawa	100.2	320	—	—	e 25 36	-22	e 40.1	—
Toronto	101.3	317	—	—	—	—	e 55.3	—
Melbourne	103.9	160	—	—	—	—	—	59.7
Chicago	105.2	311	26 36	?S	(26 36)	- 8	61.6	—
Victoria	130.8	308	—	—	—	—	68.5	73.9
Honolulu E.	150.8	252	—	—	—	—	e 67.6	—

Additional readings: Helwan gives also PN = +19m.36s. Rocca di Papa
 iPN = +12m.30s. Paris MN = +47.6m. Uccle SR₁ = +29m.6s.
 De Bilt eSR₁ = +29m.19s., MN = +47.6m. Hamburg eL = +45.6m.
 Eskdalemuir eN = +29m.41s. Toronto L = +66.2m. and +81.7m.
 Chicago S = +32m.16s., eL = +41.6m. Honolulu eN = +73.6m.

July 13d. Readings also at 0h. (Wellington), 2h. (Kodaikanal, Colombo, and Helwan), 5h. (Helwan), 13h. (Toronto, Melbourne, Chicago, Victoria, Manila, Honolulu, Zi-ka-wei, Batavia, and Riverview), 14h. (Manila and De Bilt), 15h. (Eskdalemuir), 17h. (La Paz), 18h. (Helwan), 21h. (La Paz and Manila).

July 14d. Readings at 7h. (near Nagasaki).

July 15d. 18h. 6m. 12s. Epicentre $2^{\circ}1'N$. $127^{\circ}8'E$. (as on 1920 Jan. 26d.).

$A = -.612$, $B = +.790$, $C = +.037$; $D = +.790$, $E = +.613$;

$G = -.022$, $H = +.029$, $K = -.999$.

A depth of focus 0.030 has been assumed.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Manila	-0.7	14.2	332	i 3 26	+ 6	5 28	-28	6.0	7.4
Batavia	-1.4	22.5	248	4 51	- 3	i 8 44	- 2	—	8.9
Taihoku	-1.5	23.7	346	5 11	+ 4	(9 17)	+ 8	9.3	—
Zi-ka-wei	-2.0	29.7	349	6 0	- 5	e 10 49	- 5	—	—
Osaka	-2.2	33.3	11	6 41	+ 2	—	—	—	13.1
Tokyo	-2.3	35.3	16	e 7 3	+ 7	—	—	—	16.4
Mito	-2.3	36.2	17	7 25	+21	(12 19)	-20	12.3	—
Adelaide	-2.4	38.4	165	—	—	e 13 30	+20	e 15.8	23.6
Mizusawa	E. -2.5	39.0	16	7 22	- 4	13 13	- 4	—	—
	N. -2.5	39.0	16	7 24	- 2	13 4	-13	—	—
Hakodate	-2.6	41.3	14	6 53	-51	13 12	-36	—	13.8
Riverview	-2.6	42.1	150	i 7 42	- 9	e 14 17	+18	e 22.6	27.4
Melbourne	-2.7	43.0	160	9 5	+69	14 6	- 5	16.8	26.0
Simla	-3.4	55.8	309	e 6 30	-172	—	—	—	—
Honolulu	-3.9	74.5	69	—	—	i 21 12	+39	39.6	42.5
Helwan	N. -4.3	94.5	300	23 48	? S	(23 48)	-28	—	—
Belgrade	-4.4	100.6	316	e 17 43	? PR ₁	i 24 4	-74	28.1	—
Vienna	Z. -4.4	102.4	321	e 17 6	?	i 24 19	-77	—	—
Hamburg	-4.5	104.3	327	e 18 12	? PR ₁	i 24 28	-86	e 52.8	—
Pompeii	E. -4.5	105.9	314	18 37	? PR ₁	24 27	-102	—	—
Padova	-4.5	106.2	319	e 18 26	? PR ₁	24 10	-122	—	—
Rocca di Papa	-4.5	106.9	315	—	—	e 25 30	-49	—	26.5
Strasbourg	-4.6	107.6	322	e 17 42	?	—	—	e 56.8	62.8
De Bilt	-4.6	107.6	326	—	—	i 24 43	-101	e 32.8	61.3
Uccle	-4.6	108.6	325	e 18 49	? PR ₁	e 27 54	+81	e 52.8	—
Moncalieri	-4.6	109.1	320	18 50	? PR ₁	28 1	+83	59.9	—
Edinburgh	-4.6	109.7	333	18 58	? PR ₁	24 48	-115	—	28.8
Eskdalemuir	N. -4.6	110.1	333	e 19 2	? PR ₁	i 28 8	+81	51.8	—
Stonyhurst	-4.6	110.5	330	18 48	? PR ₁	—	—	—	29.8
Oxford	-4.6	111.1	329	—	—	i 27 54	+57	—	—
Algiers	-4.7	115.7	313	e 17 33	[-67]	25 12	-145	31.3	—
Rio Tinto	—	122.0	318	29 48	? S	—	—	—	31.8
La Paz	—	158.8	134	19 57	[-10]	—	—	—	—

Additional readings: Manila gives also MN = +6.4m. Batavia i = +6m.5s.
 Zi-ka-wei PSN = +13m.37s. Osaka MN = +14.8m. Tokyo MN =
 +17.9m. Riverview i = +9m.30s., eSR₁ = +17m.30s., and +17m.49s.
 MN = +29.1m. Honolulu eE = +36m.21s. Helwan PE = +21m.48s.
 Vienna iPZ = +17m.54s. Hamburg iPZ = +18m.18s. Padova
 +20m.10s., +24m.16s., and +25m.16s. Rocca di Papa eE = +17m.36s.,
 eN = +17m.42s., eE = +18m.18s., e = +18m.48s. De Bilt ePR₁ =
 +18m.41s., MN = +59.5m. Uccle i = +24m.45s. Eskdalemuir
 iN = +24m.52s. and +25m.49s. Oxford i = +24m.28s.

July 15d. Readings also at 1h. (Rocca di Papa and La Paz), 2h. (Helwan), 5h. (near Manila), 6h. (Uccle, De Bilt, Hamburg, Zi-ka-wei, and Batavia), 10h. (Batavia), 11h. (Manila), 14h. (La Paz), 16h. (Manila and Paris), 18h. (Taihoku), 23h. (near Manila).

July 16d. Readings at 6h. (Taihoku), 10h. (Helwan), 15h. (Stonyhurst (2)).

July 17d. Readings at 5h. (La Paz), 10h. (Tokyo and near Mizusawa), 17h. (Nagasaki), 18h. (Tortosa), 20h. (near Batavia), 21h. (La Paz, De Bilt, and near Batavia).

July 18d. 17h. 3m. 0s. Epicentre $23^{\circ}\cdot 0\text{N}$. $121^{\circ}\cdot 7\text{E}$. (as on 1919 Dec. 20d.).

$$A = -\cdot 484, B = +\cdot 783, C = +\cdot 391; \quad D = +\cdot 851, E = +\cdot 526; \\ G = -\cdot 205, H = +\cdot 332, K = -\cdot 921.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.9	359	0 45	+16	(0 45)	- 8	1.1	1.2
Hokoto	2.1	284	0 23	-10	(0 40)	-18	0.7	0.8
Zi-ka-wei	8.2	358	e 2 4	0	e 3 44	+ 2	—	4.5
Manila	8.4	185	—	—	—	—	e 4.5	—
Tokyo	19.9	47	e 4 25	-15	—	—	—	—
Helwan	79.2	298	37 0	?L	—	—	(37.0)	—
Vienna	82.6	320	19 0	?PR ₁	—	—	—	—
Hamburg	83.6	326	—	—	—	—	e 44.0	45.8
De Bilt	E. 86.8	326	—	—	23 32	- 7	e 44.0	48.2
N. 86.8	326	—	—	—	23 40	+ 1	e 43.0	48.2
Strasbourg	87.4	321	—	—	—	—	e 47.0	49.2
Uccle	88.0	325	e 23 36	?S	(e 23 36)	-16	e 44.0	48.2
Edinburgh	88.4	331	30 0	?SR ₁	—	—	—	50.0
Eskdalemuir	88.8	331	—	—	e 23 56	- 5	43.0	49.4
Besançon	89.2	321	—	—	—	—	49.0	—
Stonyhurst	89.4	330	e 30 0	?SR ₁	—	—	—	53.0
Kew	89.9	328	45 0	?L	—	—	(45.0)	56.0
Paris	90.1	325	—	—	—	—	e 53.0	53.0
Oxford	90.2	328	—	—	—	—	44.5	51.6
Tortosa	96.0	319	—	—	—	—	e 51.0	55.3
Algiers	96.9	315	—	—	—	—	e 50.0	57.5
Coimbra	101.7	323	—	—	e 31 0	?SR ₁	e 50.0	—

Additional readings: Zi-ka-wei gives also MN = +4.6m. Helwan PN = +43m.0s. Vienna gives its reading as on 19d. Strasbourg MN = +49.3m. Uccle eS = +31m.54s. (?SR₁). Eskdalemuir MN = +48.2m.

July 18d. Readings also at 0h. and 1h. (near Batavia), 2h. (Taihoku), 4h. (La Paz), 6h. (Rio Tinto and Helwan), 11h. (Manila and Batavia), 14h. (Strasbourg), 17h. (Taihoku).

July 19d. Readings at 1h. (Taihoku and La Paz), 2h. (Batavia), 3h. and 5h. (near Nagasaki), 8h. (Taihoku), 10h. and 15h. (La Paz), 18h. (Taihoku), 20h. (La Paz).

July 20d. 5h. 25m. 35s. Epicentre $70^{\circ}\cdot 0\text{N}$. $11^{\circ}\cdot 0\text{W}$. (see 1919 Feb. 15d. 2h. note).

$$A = +\cdot 336, B = -\cdot 065, C = +\cdot 940; \quad D = -\cdot 191, E = -\cdot 982; \\ G = +\cdot 922, H = -\cdot 179, K = -\cdot 342.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	14.5	162	—	—	—	—	—	8.4
Eskdalemuir	15.1	163	—	—	—	—	7.4	—
Hamburg	19.0	139	e 4 22	- 7	—	—	e 11.0	—
Kew	19.2	159	—	—	—	—	—	28.4
De Bilt	19.4	149	4 42	+ 8	8 19	+ 9	e 10.4	13.0
Uccle	20.5	151	e 4 46	- 1	e 8 38	+ 4	e 10.4	—
Strasbourg	23.2	147	5 12	- 7	—	—	—	—

De Bilt gives also MN = +12.5m.

July 20d. Readings also at 1h. (Colombo), 4h. (near Mizusawa), 9h. (La Paz), 11h. (Taihoku), 12h. (La Paz), 14h. (near Sarajevo), 16h. (Taihoku (2)), 17h. (Melbourne), 18h. (Strasbourg).

July 21d. 0h. 16m. 12s. Epicentre $13^{\circ}0'N$. $123^{\circ}0'E$. (as on 1919 April 27d.).

$$A = -.531, B = +.817, C = +.225; \quad D = +.839, E = +.545; \\ G = -.123, H = +.189, K = -.974.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Manila		2.6	309	e 0 52	+11	—	—	1.7	2.0
Zi-ka-wei		18.2	356	e 3 57	-22	—	—	—	—
Helwan		85.0	300	23 48	?S	(23 48)	+29	—	—
Hamburg		92.6	327	—	—	—	—	e 50.8	—
De Bilt	E.	95.9	328	—	—	e 23 54	-81	e 51.8	62.5
	N.	95.9	328	—	—	—	—	e 50.8	58.5
Uccle		96.9	326	—	—	—	—	e 48.8	—
Eskdalemuir		98.2	332	—	—	—	—	47.8	—

Additional readings: Helwan PN = +58m.48s.

July 21d. Readings also at 10h. (Hamburg and De Bilt), 14h. (near Sarajevo), 17h. (La Paz), 20h. (Chicago and near Berkeley and Lick), 23h. (near Lick and near Tacubaya, Puebla, and Vera Cruz).

July 22d. Readings at 6h. and 7h. (near Zurich), 8h. (Helwan, Colombo, and near Tokyo and Mizusawa), 14h. (Melbourne), 15h. (near La Paz), 17h. (La Paz, near Mostar, and near Taihoku), 18h. (Melbourne), 19h. (De Bilt, Rocca di Papa, Helwan, Strasbourg, and near Athens).

July 23d. Readings at 5h. (Manila and near Mizusawa), 6h. and 7h. (near Padova), 8h. (Honolulu, Melbourne, and Christchurch), 9h. (Helwan and Simla), 14h. (Melbourne), 15h. (Taihoku), 20h. (La Paz), 22h. (Pola).

July 24d. 19h. 20m. 0s. Epicentre $39^{\circ}0'N$. $27^{\circ}0'E$. (as on 1918 June 19d.).

$$A = +.692, B = +.353, C = +.629; \quad D = +.454, E = -.891; \\ G = +.561, H = +.286, K = -.777.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Athens		2.8	248	0 45	+1	(1 14)	-3	1.2	1.5
Belgrade	N.	7.6	322	e 1 33	-22	2 53	-33	3.8	4.1
Helwan		9.8	158	9 0	?	—	—	—	—
Pompeii	E.	9.8	284	4 0	?S	(4 0)	-23	—	—
Lemberg		11.0	350	—	—	—	—	e 6.2	7.3
Rocca di Papa		11.2	289	2 49	+2	4 48	-11	(5.5)	—
Vienna		12.0	324	e 6 12	?L	—	—	(e 6.2)	7.6
Strasbourg		16.8	311	e 4 3	+1	—	—	e 9.0	10.6
Hamburg		18.6	327	—	—	—	—	e 9.0	13.2
Uccle		19.8	314	—	—	—	—	e 10.0	11.5
De Bilt		20.0	313	—	—	e 8 26	+3	e 10.0	11.4
Eskdalemuir		25.9	319	—	—	—	—	14.0	—

Additional readings: Athens gives also P = +49s. Belgrade eP = +2m.13s., ME = +3.1m. Zante ($\Delta = 6.7$) gives just 19h.50m. Helwan PN = +7m.0s. Rocca di Papa gives L as SE, also L = +12.8m. and +14.5m. De Bilt MN = +11.5m.

July 24d. Readings also at 4h. (near Rocca di Papa), 8h. (La Paz), 9h. (Helwan), 13h. (La Paz), 18h. (Budapest), 19h. (Eskdalemuir, Zi-ka-wei, and near Manila), 20h. (De Bilt, Uccle, Hamburg, and near Athens), 21h. (Ottawa, Zi-ka-wei, and near Manila), 22h. (Eskdalemuir, De Bilt, Uccle, and Hamburg).

July 25d. 1h. 40m. 35s. Epicentre $24^{\circ}0'N$. $123^{\circ}0'E$. (as on 1920 Mar. 13d.).

A = -·498, B = +·766, C = +·407; D = +·839, E = +·545;
G = -·224, H = +·341, K = -·913.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku	1·7	308	0 33	+ 7	—	—	0·9	1·0
Hokoto	3·2	262	2 41	+111	(2 41)	+73	3·1	—
Zi-ka-wei	7·3	349	e 1 52	+ 1	e 3 34	+16	—	4·5
Manila	9·6	192	—	—	e 3 7	-71	7·6	—
Helwan	79·7	298	52 25	?L	—	—	(52·4)	—
Hamburg	83·4	327	—	—	—	—	e 44·4	53·4
De Bilt	86·7	327	—	—	e 23 27	-11	e 44·4	55·0
Strasbourg	87·4	323	—	—	—	—	e 35·9	54·4
Uccle	87·8	326	—	—	—	—	e 43·4	57·4
Rocca di Papa	88·0	316	e 12 55	-10	—	—	e 55·0	—
Edinburgh	88·0	333	—	—	—	—	—	56·4
Eskdalemuir	88·4	333	—	—	—	—	44·4	57·1
Paris	90·0	326	—	—	—	—	57·4	—
Rio Tinto	102·2	321	61 25	?L	—	—	(61·4)	65·4

Additional readings: Zi-ka-wei gives also MN = +4·3m. Helwan PN = +50m.25s. De Bilt MN = +56·3m. Uccle MN = +48·4m. Rocca di Papa iPN = +12m.51s.

July 25d. 19h. 27m. 14s. Epicentre $24^{\circ}0'N$. $123^{\circ}0'E$. (as at 1h.).

A = -·498, B = +·766, C = +·407; D = +·839, E = +·545;
G = -·224, H = +·341, K = -·913.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku	1·7	308	0 29	+ 3	—	—	0·9	0·9
Hokoto	3·2	262	0 47	- 3	—	—	1·1	1·4
Zi-ka-wei	7·3	349	e 1 51	0	e 3 19	+ 1	—	5·0
Manila	9·6	192	e 2 24	0	5 6	?L	5·8	10·0
Osaka	15·2	43	4 38	+56	—	—	—	14·6
Tokyo	18·6	47	—	—	e 7 32	-21	—	—
Batavia	34·1	209	e 6 31	-35	—	—	—	7·8
Kodaikanal	45·5	261	28 16	?L	—	—	(28·3)	—
Lemberg	77·4	320	—	—	—	—	e 40·6	44·7
Helwan	E. 79·7	298	19 46	?	—	—	—	—
Vienna	82·6	321	—	—	—	—	32·8	—
Hamburg	83·4	327	e 13 46	+68	—	—	e 42·8	45·5
Padova	86·6	320	60 7	?	—	—	—	—
De Bilt	E. 86·7	327	—	—	e 25 27	?	e 45·8	48·1
	N. 86·7	327	—	—	e 21 44	?	e 43·8	47·9
Dyce	86·7	334	—	—	—	—	32·8	—
Strasbourg	87·4	323	—	—	—	—	e 46·8	49·0
Uccle	87·8	326	—	—	e 20 46	?	e 42·8	47·9
Rocca di Papa	88·0	316	i 13 2	- 3	e 22 20	-92	e 53·1	—
Edinburgh	88·0	333	—	—	—	—	46·8	49·8
Eskdalemuir	88·4	333	13 6	- 1	24 6	+10	42·8	47·9
Stonyhurst	89·1	330	e 20 4	?	—	—	—	51·8
Besançon	89·1	323	—	—	—	—	47·8	—
Kew	89·6	329	35 46	?L	—	—	(35·8)	55·8
Paris	90·0	326	—	—	—	—	47·8	49·8
Oxford	90·0	329	—	—	—	—	45·5	54·2
Tortosa	96·1	320	—	—	—	—	e 46·8	55·1
Algiers	97·0	316	—	—	—	—	—	57·3
Coimbra	101·6	324	e 21 46	?	e 34 46	?SR ₁	52·1	—
Ottawa	108·5	13	—	—	e 34 28	?SR ₁	e 49·8	—
Ann Arbor	109·2	20	—	—	—	—	30·5	—
Toronto	109·3	15	—	—	—	—	i 50·7	—

Additional readings and notes: Hokoto readings increased by 1m. Zi-ka-wei gives also MN = +4·6m. Manila MN = +8·1m. Osaka MN = +16·0m. Tokyo reading is given as at 18h. Dehra Dun ($\Delta = 40^{\circ}3'$) gives just 19h.26m. Helwan PN = +16m.46s. Hamburg MN = +45·8m., MZ = +49·8m. Padova PR₁ = +61m.55s.; these readings appear to be given in G.M.T. instead of Central European time. Strasbourg MN = +52·0m. Rocca di Papa iPE = +13m.22s. Paris MN = +51·8m. Ottawa e = +30m.16s. Ann Arbor LN = +30·3m. Toronto L = +32·0m.

July 25d. Readings also at 1h. (Taihoku (2)), 5h. (near Lick and Berkeley), 6h. (San Fernando), 10h. (near Florence), 14h. (Stonyhurst and La Paz), 16h. (Stonyhurst and near Batavia), 18h. (Hamburg), 19h. (Toronto, Ann Arbor, and Ottawa), 20h. (Taihoku and near Batavia), 21h. (De Bilt, Colombo, Dehra Dun, Hamburg, Simla, and Stonyhurst), 22h. (Taihoku and near Tokyo and Mizusawa), 23h. (near Batavia).

July 26d. 10h. 37m. 6s. Epicentre $46^{\circ}0'N$. $152^{\circ}5'E$. (as on 1920 July 18d.).

$$A = -.616, B = +.321, C = +.719; \quad D = +.462, E = +.887; \\ G = -.638, H = +.332, K = -.695.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	10.8	235	3 0	+19	4 52	+ 2	—	—
Tokyo		14.1	227	—	—	e 6 2	- 8	—	—
Zi-ka-wei		28.1	250	e 6 5	- 4	e 11 7	+ 6	—	—
Honolulu		47.0	105	15 32	?S	(15 32)	- 9	24.4	25.6
Hamburg		75.4	335	—	—	—	—	e 35.9	46.9
De Bilt	E.	78.0	340	—	—	—	—	e 43.9	45.4
	N.	78.0	340	—	—	—	—	e 41.9	52.7
Uccle		79.4	340	—	—	—	—	e 40.9	—
Rocca di Papa		85.2	331	i 12 48	- 1	—	—	e 55.2	64.2
Helwan		87.3	309	50 54	?L	—	—	(50.9)	—
Rio Tinto		94.1	344	52 54	?L	—	—	(52.9)	61.9

Additional readings: Mizusawa gives also SN = +4m.55s. Honolulu eN = +22m.15s., MN = +24.9m. Rocca di Papa iPN = +12m.52s.

July 26d. Readings also at 6h. (near Tokyo), 7h. (near La Paz), 8h. (Helwan, Belgrade, and near Athens), 14h. (Simla), 15h. (2) and 23h. (La Paz).

July 27d. Readings at 9h. (near Tokyo), 11h. (Cape Town), 17h. (near Tokyo and Mizusawa), 19h. (Tacubaya), 20h. (near Tokyo), 23h. (Taihoku).

July 28d. Readings at 4h. and 13h. (Tacubaya), 14h. (Algiers and near Tokyo), 17h. (Cape Town), 19h. (La Paz).

July 29d. 0h. 28m. 50s. Epicentre $15^{\circ}0'S$. $172^{\circ}0'W$. (as on 1921 May 3d. epicentre and time given by Apia).

$$A = -.956, B = -.134, C = -.259; \quad D = -.139, E = +.990; \\ G = +.256, H = +.036, K = -.966.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia		1.2	11	i 0 20	+ 2	—	—	—	7.2
Christchurch		31.4	201	—	—	10 52	-66	16.1	18.0
Riverview		38.1	233	e 8 21	+42	—	—	e 15.4	18.1
Honolulu	E.	38.8	23	13 37	?S	(13 37)	-12	17.7	18.3
	N.	38.8	23	—	—	—	—	17.1	18.7
Melbourne		44.2	231	—	—	e 13 22	?	—	25.4
Adelaide		48.4	237	—	—	e 15 28	-31	e 21.3	28.8
Berkeley		70.5	40	—	—	—	—	e 33.5	—
Manila		72.5	291	e 11 10	-23	—	—	—	—
Victoria		76.7	31	21 59	?S	(21 59)	+14	32.8	38.2
Chicago		95.9	50	23 53	?S	(23 53)	-82	e 45.2	—
Toronto		102.2	48	—	—	—	—	e 57.9	62.0
Colombo		109.3	273	41 10	?L	—	—	(41.2)	94.2
Edinburgh		138.3	10	—	—	—	—	69.2	76.2
Eskdalemuir		138.8	10	—	—	—	—	65.2	76.3

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Stonyhurst	140.3	11	e 69 10	?L	—	—	(e 69.2)	80.2
Hamburg	141.4	359	e 22 28	?PR ₁	—	—	e 70.2	75.2
Oxford	142.5	11	—	—	—	—	—	76.5
De Bilt	E. 142.9	3	—	—	—	—	e 69.2	83.5
	N. 142.9	3	—	—	—	—	e 66.2	73.6
Kew	143.0	11	—	—	—	—	—	83.2
Vienna	146.1	350	i 19 30	[-20]	—	—	—	20.7
Strasbourg	146.5	0	19 31	[-20]	—	—	—	—
Belgrade	148.4	343	e 18 39	[-74]	—	—	—	—
Moncalieri	150.0	1	e 20 15	[+19]	33 43	?	60.3	87.4
Coimbra	151.0	26	—	—	e 49 10	?	e 77.2	—
Rocca di Papa	153.0	352	i 19 41	[-19]	—	—	—	20.4
Tortosa	153.4	13	—	—	—	—	e 71.2	78.2
Helwan	E. 153.9	309	35 10	?	—	—	—	—

Additional readings: Apia gives MN = +4.2m., MV = +0.7m., also the T₀ and origin adopted. Christchurch PR₁? = +6m.28s., SR₁ = +13m.28s. Riverview e(P?) = +8m.42s., MN = +20.3m. Honolulu S = +16m.12s. Victoria S? = +26m.25s. Chicago S? = +31m.40s. Toronto e? = +35m.28s., i = +49m.10s., e = +53m.28s., i = +55m.10s., eL = +69.7m. and +78.7m. Eskdalemuir MN = +72.1m. Hamburg MN = +78.2m., MZ = +84.2m. De Bilt ePR₁N = +23m.22s. Belgrade eP = +20m.34s., eSR₁ = +21m.59s. (?PR₁). Helwan PN = +41m.10s.

July 29d. Readings also at 2h. (Manila and Batavia), 3h. (Zi-ka-wei), 5h. (La Paz), 7h. (near Athens), 11h. (Uccle), 14h. (near La Paz), 15h. (Manila, Zi-ka-wei, Helwan, and near Taihoku and Hokoto; these do not fit the origin of July 25d. very accurately), 21h. (near Taihoku).

July 30d. Readings at 8h. (Melbourne), 9h. (near Tokyo), 10h. and 12h. (La Paz), 13h. (Tortosa), 15h. (Colombo), 16h. (Manila), 19h. (Taihoku), 21h. (near Rocca di Papa and Pompeii).

July 31d. 9h. 50m. 42s. Epicentre 15°.7S. 167°.3E. (as on 1920 July 6d.).

A = - .939, B = + .212, C = - .271; D = + .220, E = + .975;
G = + .264, H = - .059, K = - .963.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	20.3	87	i 4 59	+14	8 46	+17	10.8	—
Riverview	23.4	216	e 5 28	+ 7	e 9 43	+10	e 10.9	13.4
Sydney	23.4	216	4 24	-57	10 0	+27	13.1	14.3
Wellington	26.4	167	e 10 18	?S	(e 10 18)	-12	e 12.1	15.3
Christchurch	28.2	172	5 24	-46	10 12	-51	13.8	17.4
Melbourne	29.7	217	—	—	11 12	-17	14.1	17.5
Adelaide	32.1	229	i 6 54	+ 6	i 11 54	-16	e 14.3	22.9
Perth	49.3	240	9 18	+16	—	—	—	—
Honolulu	50.3	44	i 16 6	?S	(i 16 6)	-17	22.5	25.7
Manila	54.9	301	e 9 34	- 4	—	—	—	—
Batavia	59.9	272	10 14	+ 3	i 18 23	+ 1	e 33.2	—
Zi-ka-wei	64.1	319	e 10 33	- 6	—	—	—	—
Berkeley	E. 84.9	48	—	—	—	—	e 38.6	40.6
	V. 84.9	48	—	—	—	—	e 39.2	41.9
Victoria	88.7	38	18 19	?PR ₁	24 43	+43	37.0	45.4
Colombo	89.5	276	54 18	?	—	—	60.3	62.3
Chicago	111.6	50	—	—	e 28 41	+59	e 51.3	—
Toronto	117.6	47	—	—	—	—	61.9	72.3
Ottawa	E. 120.0	45	—	—	e 30 18	+89	64.8	—
Cape Town	122.1	210	67 54	?L	—	—	(67.9)	—
Helwan	E. 137.3	297	22 0	?PR ₁	—	—	—	202.2
Hamburg	138.2	340	e 19 46	[+10]	—	—	e 70.3	74.3
Eskdalemuir	N. 139.7	351	e 22 11	?SR ₁	e 40 41	?SR ₁	68.3	—
De Bilt	E. 140.9	341	e 19 53	[+12]	e 23 17	?PR ₁	e 72.3	74.3
	N. 140.9	341	—	—	—	—	e 73.3	81.9

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Stonyhurst	141.0	350	e 70 18	?L	—	—	(e 70.3)	95.3
Bidston	141.6	350	—	—	—	—	72.8	83.3
Uccle	142.3	341	e 22 42	?PR ₁	e 32 30	?	—	79.3
Strasbourg	143.1	336	e 19 35	[-10]	e 22 41	?PR ₁	76.3	—
Paris	144.6	344	e 19 32	[-16]	22 56	?PR ₁	73.3	81.3
Pompeii	E. 145.6	322	19 18	[-31]	—	—	—	—
Moncalieri	146.0	335	19 37	[-13]	31 42	?	50.5	—
Rocca di Papa	146.0	325	19 42	[-8]	—	—	e 77.5	82.2
Tortosa	152.4	338	20 1	[+2]	—	—	—	—
Algiers	154.7	329	e 20 20	[+18]	—	—	e 77.3	102.3
Coimbra	E. 155.2	352	19 47	[-15]	—	—	74.3	—
Granada	157.1	341	i 20 16	[+11]	(44 42)	?SR ₁	e 44.7	—
Rio Tinto	157.3	347	80 18	?L	—	—	(80.3)	102.3
San Fernando	158.5	346	—	—	—	—	86.3	114.3

Additional readings and notes: Apia readings are given one hour late. River-view readings are given one hour late, also eS = +10m.0s. and +10m.17s., MN = +12.8m., MZ = +14.2m. Melbourne SR₁ = +12m.12s. Adelaide e = +17m.0s. and +18m.18s. Honolulu SE = +20m.18s., SN = +18m.36s., MN = +25.1m. Batavia i = +13m.33s. and +14m.3s. Berkeley eLN = +39.8m. Chicago L = +54.3m. Toronto e = +31m.48s. and +42m.12s., eL = +65.9m. Ottawa e?E = +37m.18s. Helwan PN = +22m.18s. Coimbra PN = +20m.24s., eL = +51.3m. San Fernando MN = +115.3m.

July 31d. Readings also at 9h. (Manila), 10h. (Berkeley), 11h. (Melbourne and Chicago), 12h. (Florence and Manila), 14h. (Florence and Rocca di Papa), 22h. (Paris), 23h. (Strasbourg and near Honolulu and near Apia).

Aug. 1d. Readings at 0h. (Uccle, De Bilt, and Stonyhurst), 1h. (Helwan and Vera Cruz), 4h. (Vera Cruz), 6h. (La Paz and Paris), 9h. (Helwan), 10h. (Vienna), 12h. (Melbourne), 13h. (Helwan), 17h. (Vienna, Batavia, and near Tokyo), 18h. (Helwan), 20h. (Taihoku).

Aug. 2d. 3h. 17m. 40s. Epicentre 39°-0N. 27°-0E. (as on July 24d.).

$$A = +.692, B = +.353, C = +.629.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	2.8	248	e 0 45	+ 1	i 1 13	- 4	1.3	1.5
Belgrade	7.6	322	e 1 45	-10	(i 3 18)	- 8	(i 4.4)	5.1
Rocca di Papa	11.2	289	e 1 50	-57	—	—	—	5.0
Vienna	12.0	324	—	—	—	—	e 6.5	—
De Bilt	20.0	318	—	—	—	—	e 10.3	—

Additional readings and notes: Athens gives also iPE = +50s. Belgrade iP = +3m.18s., iSR₁ = +4m.23s., taken as S and L. Rocca di Papa eN = +1m.56s., i = +3m. 55s.

Aug. 2d. Readings also at 2h. (Zante), 6h. (near Batavia), 7h. (Wellington), 11h. (La Paz and Apia), 12h. (Helwan), 13h. and 14h. (2) (La Paz), 15h. (Melbourne), 19h. (2) and 20h. (La Paz), 23h. (Simla).

Aug. 3d. Readings at 0h. (De Bilt), 10h. (Taihoku), 12h. (Melbourne), 16h. (Rocca di Papa and near Belgrade and Sarajevo), 22h. (Manila).

Aug. 4d. Readings at 6h. (Taihoku and near Zurich), 19h. (near Colima), 23h. (Batavia).

Aug. 5d. 1h. 23m. 36s. Epicentre $48^{\circ}08'. 17^{\circ}0'W$.

$A = +.640$, $B = -.196$, $C = -.743$; $D = -.292$, $E = -.956$;
 $G = -.711$, $H = +.217$, $K = -.669$.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz		52.1	289	i 9 22	+ 1	i 16 48	+ 3	25.9	30.3
Helwan	N.	89.1	40	24 24	?S	(24 24)	+20	—	—
Melbourne		92.8	167	—	—	—	—	—	42.9
Rocca di Papa		93.5	22	—	—	e 24 48	- 3	e 57.1	—
Paris		98.2	13	—	—	e 57 24	?	60.4	62.4
Uccle		100.5	14	—	—	e 28 48	?	e 52.4	57.4
Kodaikanal		100.6	86	56 0	?L	—	—	(56.0)	—
De Bilt	E.	101.8	15	—	—	e 35 5	?SR ₁	e 49.4	61.1
	N.	101.8	15	—	—	e 29 11	?	e 50.4	63.1

Additional readings: Helwan gives also PE = +26m.24s. Uccle e = +34m.52s.

Aug. 5d. Readings also at 0h. and 2h. (La Paz), 3h. (Wellington), 5h. (Lemberg), 6h., 7h., 9h., and 11h. (La Paz), 12h. (Manila), 14h. (La Paz and Wellington), 15h. (Melbourne), 18h. (Algiers), 19h. (Helwan and Algiers), 23h. (near Tortosa).

Aug. 6d. Readings at 2h. (De Bilt and Helwan), 13h. (near Sarajevo), 22h. (near Tokyo), 23h. (near La Paz).

Aug. 7d. Readings at 6h. (Georgetown), 13h. (near Tokyo), 14h. (La Paz), 15h. (Manila), 23h. (Melbourne).

Aug. 8d. Readings at 0h. (near La Paz), 3h. (Apia), 4h., 6h., 7h., 9h., and 14h. (La Paz), 15h. (Taihoku).

Aug. 9d. 10h. 38m. 0s. Epicentre $43^{\circ}0'N. 146^{\circ}0'E$.

$A' = -.606$, $B = +.409$, $C = +.682$; $D = +.559$, $E = +.829$;
 $G = -.565$, $H = +.382$, $K = -.731$.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Hakodate		4.1	253	1 18	+14	—	—	2.1	2.4
Ootomari		4.3	328	1 7	0	—	—	—	—
Mizusawa	E.	5.3	225	1 30	+ 8	2 29	+ 4	—	—
Akita		5.5	236	1 29	+ 4	—	—	2.8	—
Niigata		7.5	228	2 0	+ 6	2 52	-32	3.8	4.6
Mito		7.8	214	2 6	+ 8	(3 28)	- 3	3.5	—
Tokyo		8.8	216	i 2 8	- 5	2 59	-59	3.7	5.1
Osaka		11.7	228	3 27	+32	(5 22)	+10	5.4	8.6
Zi-ka-wei		22.7	247	e 5 10	- 3	e 9 18	- 1	—	16.3
Manila		35.6	224	e 7 32	+14	—	—	—	—
Honolulu	E.	51.0	96	—	—	—	—	23.3	25.4
	N.	51.0	96	—	—	—	—	23.4	25.5
Hamburg		76.3	334	i 11 58	+ 1	i 21 38	- 3	e 45.0	49.0
Eskdalemuir		78.2	343	e 12 7	- 1	e 22 2	0	40.0	—
Vienna		78.6	329	i 12 10	- 1	e 21 18	-49	—	49.0
De Bilt		79.0	336	e 12 9	- 4	e 22 7	- 5	e 39.0	43.0
Uccle		80.4	336	e 12 19	- 2	e 22 21	- 7	e 39.0	43.0
Kew		81.1	340	—	—	—	—	—	90.0
Strasbourg		81.4	334	e 12 23	- 4	—	—	e 43.0	55.0
Paris		82.7	337	e 12 36	+ 2	e 22 49	- 5	46.0	—
Rocca di Papa		85.4	327	i 12 45	- 5	i 23 26	+ 3	e 45.2	—
Helwan	E.	85.7	308	24 0	?S	(24 0)	+33	—	—
La Paz		140.7	56	19 34	[- 6]	—	—	—	—

Additional readings: Hakodate gives also MN = +3.1m. Niigata MN = +4.8m. Tokyo MN = +6.5m. Osaka MN = +10.4m. De Bilt MN = +50.2m. Epicentre $41^{\circ}5'N. 144^{\circ}2'E$. Rocca di Papa iSN = +23m.20s. Helwan PN = +25m.0s.

Aug. 9d. Readings also at 4h. (near Nagasaki and Osaka), 6h. and 7h. (near Nagasaki), 8h. (near Mizusawa), 14h. (Paris), 18h. (Helwan), 22h. (near Colima).

Aug. 10d. 14h. 10m. 30s. Epicentre $41^{\circ}0'N$. $21^{\circ}5'E$. (as on 1920 Sept. 14d.).

$$A = +.702, B = +.277, C = +.656; \quad D = +.366, E = -.930; \\ G = +.610, H = +.240, K = -.755.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	E.	3.3	150	e 1 22	+30	2 23	+52	2.6	3.2
	N.	3.3	150	i 1 20	+28	2 23	+52	2.6	3.3
Mostar		3.6	312	i 0 42	-14	i 1 20	-19	—	1.7
Sarajevo		3.7	322	i 0 50	-8	1 37	-5	—	2.8
Belgrade		3.9	349	i 0 42	-19	i 1 26	-21	—	1.6
Sinj		4.5	308	0 54	-16	1 50	-14	—	3.0
Pompeii	E.	5.3	270	1 39	+17	2 44	+19	(2.7)	3.7
Rocca di Papa		6.7	280	i 1 48	-6	i 2 56	-6	i 3.6	4.6
Budapest		6.7	346	i 1 14	-28	e 2 13	-49	e 3.0	3.7
Pola		6.8	307	e 1 52	+8	—	—	e 3.6	4.3
Florence		8.1	294	2 5	+2	—	—	—	5.5
Vienna		8.1	335	i 1 53	-10	—	—	3.5	5.0
Padova		8.3	306	2 4	-2	4 27	+42	—	4.5
Lemberg		9.0	10	e 2 10	-6	e 4 18	+15	—	4.8
Milan		10.0	301	3 39	+69	4 57	+28	—	6.1
Zurich		11.2	309	e 2 39	-8	i 5 25	+26	—	—
Marseilles		12.1	287	2 2	-58	(e 5 30)	+9	e 5.5	6.4
Strasbourg		12.3	312	e 2 54	-9	e 5 48	+22	—	7.7
Besançon		12.7	305	3 5	-4	6 0	+23	6.5	—
Helwan		13.7	141	2 30	-52	—	—	(8.5)	—
Barcelona		14.6	278	e 3 35	+1	—	—	e 8.1	10.2
Hamburg		14.8	332	i 3 27	-9	e 6 6	-21	e 8.2	11.1
	Z.	14.8	332	i 3 26	-10	e 6 5	-22	e 8.2	10.2
Algiers		14.9	260	e 3 45	+7	e 6 39	+9	8.5	11.0
Uccle		15.4	316	e 3 37	-7	e 6 39	-2	e 7.6	9.5
Paris		15.6	307	e 3 45	-2	e 6 47	+1	8.0	8.5
De Bilt		15.8	320	3 43	-6	6 38	-12	8.5	11.5
Tortosa		15.8	276	3 53	+4	—	—	7.5	10.3
Kew		18.2	312	—	—	—	—	—	11.5
Oxford		19.0	312	i 4 0	-29	i 7 30	-32	9.5	11.8
Granada		19.8	267	4 58	+19	8 39	+20	—	—
Stonyhurst		20.5	317	4 48	+1	8 42	+8	10.0	14.5
Bidston		20.6	315	—	—	8 21	-15	10.4	11.5
Eskdalemuir		21.7	320	4 48	-13	8 36	-23	11.5	—
Edinburgh		21.9	321	i 5 0	-4	i 8 46	-17	11.8	14.2
Dyce	E.	22.2	325	4 59	-8	8 57	-12	—	—
Coimbra	E.	22.7	278	5 10	-3	9 2	-17	13.5	14.4
	N.	22.7	278	5 10	-3	e 9 21	+2	13.4	13.8

Additional readings and notes: Belgrade gives also iPE = +51s. and iPN = +50s. Rocca di Papa MN = +4.0m. Pola MN = +3.7m. Vienna LZ = +3.6m., MZ = +5.5m. Padova +5m.30s. and +9m.53s. Zurich iP = +2m.43s. Strasbourg MN = +7.2m., MZ = +7.3m. Helwan gives its readings as PN and PE respectively. Hamburg MN = +10.3m. Granada gives its readings as 11d. De Bilt MN = +10.5m. Dyce SN = +8m.52s.

Aug. 10d. Readings also at 3h. (Helwan), 4h. (near Sarajevo), 5h. (Manila and near Mizusawa), 12h. (near La Paz), 14h. (Rocca di Papa, Padova, and Belgrade), 17h. (Helwan, Sarajevo, and La Paz).

Aug. 11d. 17h. 34m. 20s. Epicentre $41^{\circ}0'N$. $21^{\circ}5'E$. (as on Aug. 10d.).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mostar		3.6	312	0 50	-6	1 16	-23	—	1.4
Belgrade		3.9	349	i 0 54	-7	i 1 44	-3	—	1.8
Pompeii	E.	5.3	270	1 40	+18	—	—	—	—
Rocca di Papa		6.7	280	e 1 28	-14	—	—	—	—
Pola		6.8	307	e 1 45	-1	—	—	e 3.2	3.4
Padova		8.3	306	1 40	-26	3 59	+14	—	7.0
Strasbourg		12.3	312	—	—	—	—	5.7	—

Additional readings: Rocca di Papa eN = +1m.34s., PR₁E = +2m.28s., PR₁N = -2m.34s.

Aug. 11d. Readings also at 11h. (near Port au Prince), 12h. (Chicago, La Paz, and near Mizusawa).

Aug. 12d. Readings at 3h. (2) and 6h. (Wellington), 23h. (Algiers).

Aug. 13d. 12h. 54m. 10s. Epicentre $9^{\circ} \cdot 2'S$. $123^{\circ} \cdot 5'E$. (suggested by Batavia).

A = $- \cdot 545$, B = $+ \cdot 823$, C = $- \cdot 160$; D = $+ \cdot 834$, E = $+ \cdot 552$;
G = $+ \cdot 088$, H = $- \cdot 133$, K = $- \cdot 987$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Batavia	16.8	279	i 4 18	+16	7 15	+ 2	—	8.8
Perth	23.8	196	(5 50)	+24	9 42	+ 2	14.0	—
Manila	24.0	354	e 5 30	+ 2	9 0	-44	10.2	10.3
Adelaide	29.2	154	e 6 20	0	e 12 2	+42	e 15.6	19.4
Melbourne	34.5	150	7 14	+ 5	12 56	+ 8	19.0	22.2
Riverview	35.3	140	e 7 5	-11	e 12 40	-20	e 16.6	21.7
Sydney	35.3	140	6 20	-56	13 2	+ 2	19.6	24.3
Colombo	46.4	288	21 50	?	—	—	30.8	31.8
Kodaikanal E.	49.8	291	29 26	?L	—	—	32.9	34.5
Helwan	96.5	299	17 50	?PR ₁	(27 50)	+149	—	—
Hamburg	111.2	324	e 19 30	?PR ₁	e 28 50	+71	e 53.8	—
De Bilt	114.5	322	—	—	e 29 30	+84	e 61.8	65.5
Ucele	115.3	321	e 29 50	?S	(e 29 50)	+98	e 60.8	63.8
Edinburgh	117.6	329	—	—	29 50	+79	—	—
Eskdalemuir	117.9	329	e 20 16	?PR ₁	e 29 49	+76	45.8	—
La Paz	151.8	156	20 16	[+17]	—	—	—	—

Additional readings: Perth gives also P = $+3m.16s.$, PR₁ has been taken as P
Manila MN = $+10.8m.$, Adelaide e = $+14m.20s.$ Riverview PS =
 $+13m.1s.$, MN = $+19.7m.$, MZ = $+25.1m.$ Helwan readings are given
as PE and PN respectively. De Bilt ePR₁E = $+19m.58s.$, MN = $+63.1m.$

Aug. 13d. Readings also at 3h. (Riverview), 19h. (Helwan).

1921. Aug. 14d. 13h. 15m. 18s. Epicentre $15^{\circ} \cdot 5'N$. $39^{\circ} \cdot 0'E$.

A = $+ \cdot 749$, B = $+ \cdot 606$, C = $+ \cdot 267$; D = $+ \cdot 629$, E = $- \cdot 777$;
G = $+ \cdot 208$, H = $+ \cdot 168$, K = $- \cdot 964$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Helwan E.	16.0	335	4 0	+ 8	8 6	?L	(8.1)	9.1
Manila N.	16.0	335	5 54	+122	10 42	?L	(10.7)	11.8
Bombay	32.5	79	e 7 56	+63	e 12 27	+11	—	—
Belgrade	33.2	336	i 6 13	-45	e 11 50	-37	e 16.9	26.8
Rocca di Papa	34.7	325	i 7 11	0	i 12 53	+ 2	—	—
Budapest	36.0	337	6 42?	-40	e 12 38	-32	e 16.7	24.7
Pola	36.2	330	e 13 10	?S	(e 13 10)	- 3	e 21.2	26.9
Florence	36.8	327	5 2	-146	—	—	—	19.7
Padova	37.5	329	7 4	-30	—	—	—	—
Vienna	37.6	335	7 35	0	13 35	+ 3	e 20.7	31.1
Kodaikanal	37.8	93	13 12	?S	(13 12)	-23	19.8	21.6
Simla	38.2	59	13 6	?S	(13 6)	-35	—	23.2
Algiers	38.3	311	7 44	+ 4	13 46	+ 4	18.7	20.7
Colombo	40.9	98	13 42	?S	(13 42)	-38	—	21.7
Barcelona	41.0	319	e 7 59	- 4	—	—	e 20.4	24.2
Besançon	41.8	325	8 12	+ 3	14 35	+ 3	17.7	—
Strasbourg	41.8	330	8 8	- 1	e 14 29	- 3	e 17.7	31.4
Tortosa	41.8	316	8 9	0	14 33	+ 1	17.4	29.1
Granada	43.4	309	8 28	+ 7	14 54	0	—	—
Hamburg	44.3	335	i 8 28	0	e 15 10	+ 4	e 22.3	28.2
Paris	44.7	325	e 8 34	+ 3	i 15 19	+ 8	18.7	16.7
Ucele	44.9	330	e 8 33	+ 1	15 15	+ 1	e 21.7	30.1
San Fernando	45.2	307	9 42	+68	19 30	?SR ₁	26.7	27.9
De Bilt	45.4	332	8 38	+ 2	15 19	- 1	e 21.7	32.4
Rio Tinto	45.8	309	17 42	?S	(17 42)	+137	—	31.7
Kew	47.6	328	19 42	?L	—	—	(19.7)	32.7
Coimbra E.	47.9	311	8 24	-29	15 32	-21	e 23.7	27.1
Manila N.	47.9	311	8 24	-29	15 54	+ 1	22.7	30.1

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Oxford	48.3	327	8 59	+ 3	19 54	?SR ₁	25.2	41.8
Stonyhurst	50.1	329	e 11 12	?PR ₁	16 30	+10	30.2	32.2
Bidston	50.1	329	9 14	+ 6	i 16 32	+12	24.1	36.4
Eskdalemuir	51.2	330	e 9 28	+14	e 16 48	+14	24.7	30.9
Edinburgh	51.5	330	9 22	+ 5	16 48	+10	28.7	31.7
Cape Town	53.1	201	19 46	?	26 36	?L	28.0	28.8
Batavia	70.6	103	—	—	i 20 48	+15	—	21.7
Manila	78.3	78	—	—	e 23 2	+58	—	—
Ottawa	E. 95.4	320	—	—	e 24 20	-50	e 46.7	—
Toronto	98.4	320	—	—	59 0	?	e 62.5	—
Ann Arbor	101.9	320	—	—	—	—	—	46.4
Chicago	104.5	321	—	—	—	—	e 57.7	—
La Paz	110.4	259	e 19 45	?PR ₁	32 16	?SR ₁	56.7	77.1
Victoria	114.2	348	—	—	—	—	68.5	—
Riverview	116.8	121	—	—	e 51 36	?	e 57.1	61.4

Additional readings: Barcelona ? = +16m.0s. Strasbourg MN = +27.5m.
Hamburg SR₁ = +18m.32s., MZ = +34.7m. Uccle SR₁ = +18m.28s.
De Bilt SR₁ = +18m.47s., MN = +29.7m. Eskdalemuir iZ = +9m.24s.,
SR₁? = +20m.19s. Toronto eL = +71.9m. Ann Arbor LE = +46.2m.
Victoria eL = +82.2m.

Aug. 14d. Readings also at 5h. (near Nagasaki), 9h. (La Paz and Coimbra),
10h. (Uccle, De Bilt, and Helwan), 12h. (La Paz), 13h. (near Mizusawa),
16h. (Riverview and Adelaide), 21h. (La Paz).

Aug. 15d. 14h. 10m. 45s. Epicentre 18°·0S. 167°·0E. (as on 1920 Sept. 21d.).

$$A = -.927, B = +.214, C = -.309; \quad D = +.225, E = +.974; \\ G = +.301, H = -.070, K = -.951.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Sydney	21.3	219	8 51	?S	(8 51)	+ 1	12.4	13.7
Riverview	21.3	219	—	—	—	—	e 10.2	16.5
Melbourne	27.7	220	e 5 51	-14	e 10 27	-27	e 13.4	19.8
Adelaide	30.4	231	—	—	—	—	e 19.2	23.4
Kodaikanal	92.8	280	(12 57)	-34	—	—	—	—
Chicago	113.2	50	—	—	—	—	e 57.2	—
Helwan	138.0	295	33 15	?S	—	—	(54.2)	—
De Bilt	143.1	342	—	—	—	—	e 86.2	—
Stonyhurst	143.2	350	78 45	?L	—	—	(78.8)	—

Additional readings: Riverview gives also MN = +14.5m., MZ = +17.1m.
Chicago L = +63.2m. Kodaikanal increased by 10min.

Aug. 15d. Readings also at 1h. (near Tacubaya and Vera Cruz), 4h. (Vera Cruz),
5h. (near Oaxaca and Tacubaya), 6h. (Apia), 7h. (Zi-ka-wei), 8h. (near
Sarajevo and Belgrade), 11h. (Manila), 13h. (near Tokyo), 22h.
(Mizusawa).

Aug. 16d. 5h. 18m. 36s. Epicentre 36°·0N. 141°·0E. (as on 1919 July 9d.).

$$A = -.629, B = +.509, C = +.588; \quad D = +.629, E = +.777; \\ G = -.457, H = +.370, K = -.809.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	1.1	253	i 0 23	+ 6	e 1 14	+43	1.8	5.4
Mizusawa	E. 3.1	1	0 57	+ 8	1 40	+14	—	—
	N. 3.1	1	0 56	+ 7	1 36	+10	—	—
Osaka	4.7	256	1 11	- 2	—	—	—	4.4
Kobe	N. 5.0	256	e 1 16	- 1	i 2 8	- 9	e 2.7	—
Zi-ka-wei	17.0	259	e 3 58	- 7	—	—	—	—
Hamburg	81.0	334	—	—	—	—	e 35.4	44.4
Eskdalemuir	83.7	342	—	—	—	—	41.4	—
De Bilt	83.9	335	—	—	—	—	e 45.4	56.0
Uccle	85.2	335	—	—	—	—	e 45.4	—
Helwan	E. 86.8	306	29 24	?	—	—	—	—
Tortosa	95.1	332	—	—	—	—	e 53.4	57.4

Additional readings and notes: Tokyo gives an alternative iP = +24s., MN =
+3.1m. Osaka MN = +4.2m. Kobe readings increased by 6min.
De Bilt MN = +54.6m. Helwan PN = +58m.24s.

Aug. 16d. Readings also at 4h. (near Mizusawa), 6h. (Batavia), 7h. (Apia, Batavia, Riverview, Helwan, and La Paz), 11h. (Wellington), 12h. (Vera Cruz), 14h. (near Tokyo and Mizusawa), 18h. (Ann Arbor and Ottawa), 22h. (near Tokyo and Mizusawa).

Aug. 17d. Readings at 1h. (near Mizusawa), 4h. (Taihoku), 6h. (Manila and Wellington), 7h. (Mizusawa), 8h. (Oaxaca and Tacubaya), 10h. and 20h. (La Paz), 21h. (Rocca di Papa), 23h. (La Paz, Victoria, Helwan, Honolulu, Tacubaya, Ottawa, and Vera Cruz).

Aug. 18d. Readings at 0h. (Chicago, Helwan, Riverview, and De Bilt), 1h. (De Bilt), 2h. (La Paz), 8h. (near Rocca di Papa), 21h. (La Paz).

Aug. 19d. 8h. 33m. 35s. Epicentre $34^{\circ}5'N$. $77^{\circ}5'W$.

$$A = +.178, B = -.805, C = +.566; \quad D = -.976, E = -.216; \\ G = +.123, H = -.553, K = -.824.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Cheltenham N.	4.3	7	e 4 35	?	—	—	5.2	5.8
Georgetown E.	4.5	4	e 1 5	— 5	—	—	e 5.2	—
N.	4.5	4	e 1 25	+15	—	—	e 5.4	—
Washington	4.5	4	2 43	?S	(2 43)	+39	4.2	—
Ithaca	8.0	1	—	—	—	—	e 6.7	—
Ann Arbor	9.2	330	—	—	—	—	5.9	—
Toronto	9.3	351	—	—	—	—	e 7.7	8.4
Chicago	10.8	315	2 38	— 3	4 45	— 5	5.6	—
Ottawa E.	11.0	7	e 3 44	+60	—	—	e 6.9	—
De Bilt	59.3	45	—	—	—	—	e 32.4	—

Additional readings: Cheltenham gives also $LE = +5.5m$. Ann Arbor $LN = +5.6m$.

Aug. 19d. Readings also at 0h. (Helwan), 15h. (Tortosa and near Mizusawa), 19h. (La Paz), 22h. (Taihoku).

Aug. 20d. Readings at 5h. (near Batavia), 6h. (Helwan), 10h. (Perth), 13h. (Manila), 20h. (Apia).

Aug. 21d. 1h. 9m. 16s. Epicentre $26^{\circ}0'N$. $50^{\circ}0'W$.

$$A = +.578, B = -.689, C = +.438; \quad D = -.766, E = -.643; \\ G = +.282, H = -.336, K = -.899.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ottawa E.	28.3	320	—	—	e 12 32	+88	e 16.7	—
Chicago	34.6	309	—	—	—	—	e 13.7	—
Stonyhurst	44.7	40	e 20 44	?L	—	—	(e 20.7)	—
Edinburgh	45.0	37	—	—	14 44	-31	—	24.7
La Paz	46.0	205	i 8 41	+ 1	—	—	—	—
Uccle	47.9	45	e 8 52	— 1	e 15 50	— 3	e 20.7	—
De Bilt	48.6	42	—	—	e 16 4	+ 3	e 21.7	25.5
Strasbourg	49.8	49	e 9 5	— 1	—	—	—	—
Helwan N.	70.5	67	36 44	?L	—	—	(36.7)	—

Additional readings: Ann Arbor ($\Delta = 32^{\circ}0'$) gives L waves at about 1h.8m.18s. Chicago L = +20.7m. De Bilt e = +20m.56s., MN = +24.5m. Helwan PE = +40m.44s.

Aug. 21d. Readings also at 4h. (Budapest and near Tokyo), 7h. (near Mizusawa), 11h. (Melbourne and Riverview), 12h. (Helwan and Manila), 20h. (Christchurch), 21h. (Manila, Apia, and near Tokyo).

Aug. 22d. 4h. 5m. 0s. Epicentre $36^{\circ}0'N$, $141^{\circ}0'E$ (as on Aug. 16d.).

A = -·629, B = +·509, C = +·588; D = +·629, E = +·777;
G = -·457, H = +·370, K = -·809.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	3·1	1	0 58	+ 9	1 41	+15	—	—
Osaka		4·7	256	1 36	+23	—	—	3·3	4·2
Kobe		5·0	256	1 16	- 1	1 29	+12	3·5	4·7
Nagasaki	N.	9·8	254	e 1 21	-66	—	—	—	—
Ootomari		10·7	6	5 15	?S	(5 15)	+27	8·3	9·4
Zi-ka-wei		17·0	259	e 3 51	-14	—	—	—	13·2
Taihoku		20·0	242	e 5 0	+19	—	—	—	—
Manila		27·9	225	e 7 0	+53	—	—	—	—
Honolulu		54·5	89	—	—	—	—	24·8	25·0
Hamburg		81·0	334	—	—	e 22 0	-35	e 45·0	50·9
Vienna		82·4	327	e 12 0	-32	—	—	—	49·5
Edinburgh		83·3	341	—	—	—	—	43·0	59·0
Eskdalemuir		83·7	342	—	—	e 23 8	+ 2	44·0	58·0
De Bilt		83·9	335	—	—	e 22 56	-12	e 45·0	51·3
Uccle		85·2	335	—	—	e 23 0	-21	e 45·0	56·0
Bidston		85·3	339	—	—	23 21	- 1	—	57·0
Kew		86·2	338	—	—	—	—	—	58·0
Helwan	N.	86·8	306	23 0	?S	(23 0)	-39	—	—
Paris		87·5	335	—	—	e 23 31	-16	47·0	56·0
Florence		88·1	326	49 0	?L	—	—	(49·0)	53·0
Rocca di Papa		89·0	324	—	—	—	—	e 49·1	54·9
Rio Tinto		100·4	334	62 0	?L	—	—	(62·0)	66·0
La Paz		147·6	60	19 47	[- 5]	—	—	—	—

Additional readings and notes: Mizusawa gives also PN = +56s. Osaka
MN = +5·8m. Kobe MN = +3·6m. Nagasaki ePE = +1m. 27s.
Zi-ka-wei MN = +12·9m. Honolulu LN = +24·7m. Hamburg
MN = +51·3m., MZ = +52·8m. De Bilt MN = +56·9m. Helwan
PE = +25m.0s.

Aug. 22d. Readings also at 0h. (near Tacubaya), 2h. (near Mizusawa), 5h. (Taihoku), 10h. (near Mizusawa), 13h. (Hamburg, De Bilt, Eskdalemuir, Uccle, Batavia, and near Manila), 14h. (De Bilt), 17h. (near Osaka, Tokyo, and Mizusawa), 21h. (De Bilt), 22h. (Taihoku).

Aug. 23d. 5h. 11m. 50s. Epicentre $56^{\circ}8'N$, $33^{\circ}6'W$. (as on 1920 Feb. 7d.).

A = +·456, B = -·303, C = +·837; D = -·553, E = -·833;
G = +·697, H = -·463, K = -·548.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	16·7	80	4 10	+ 9	—	—	8·2	12·2
Eskdalemuir	16·9	82	e 4 4	0	e 7 17	+ 1	8·2	10·4
Bidston	17·6	88	4 10	- 2	7 40	+ 9	9·2	13·2
Stonyhurst	17·8	86	e 4 10	- 5	—	—	—	10·7
Oxford	19·3	91	i 4 37	+ 4	—	—	9·3	10·9
Kew	20·0	88	—	—	—	—	—	11·2
De Bilt	22·7	85	5 13	0	9 22	+ 3	11·4	13·7
Uccle	22·9	89	e 5 15	- 1	e 9 27	+ 4	e 11·1	—
Paris	22·9	95	e 5 10?	- 6	9 30	+ 7	12·4	13·2
Coimbra	23·3	125	5 26	+ 6	9 44	+ 13	11·2	12·1
Hamburg	24·7	79	e 5 30	- 5	e 9 46	-11	e 14·3	17·2
Strasbourg	25·9	91	e 5 34	-13	—	—	—	—
Vienna	30·8	82	e 5 10?	? (e 11 34)	—	-14	e 11·6	18·6
Rocca di Papa	32·9	95	i 6 52	- 4	11 40	-42	e 20·5	—
La Paz	78·8	213	13 11	+59	—	—	—	—

Additional readings: Eskdalemuir gives also eN = iZ = +4m.5s. De Bilt
MN = +13·9m. Hamburg MN = +16·3m. Vienna eS?? = +9m.10s.

1921. Aug. 23d. 20h. 17m. 16s. Epicentre $67^{\circ}\cdot5\text{N}$. $18^{\circ}\cdot6\text{W}$.

(as on 1913 July 26d.).

A = $+\cdot363$, B = $-\cdot122$, C = $+\cdot924$; D = $-\cdot319$, E = $-\cdot948$;G = $+\cdot876$, H = $-\cdot295$, K = $-\cdot383$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Dyce	N.	12.7	136	e 3 6	- 3	i 5 36	- 1	6.0	6.9
Edinburgh		13.6	141	3 21	0	5 45	-13	—	8.5
Eskdalemuir N.		14.1	142	i 3 26	- 1	i 6 11	+ 1	6.7	7.7
Stonyhurst		15.7	143	e 4 2	+14	(i 6 56)	+ 8	i 6.9	9.7
Bidston		15.9	144	—	—	6 49	- 4	—	16.2
West Bromwich		17.0	143	4 5	0	7 14	- 4	—	—
Oxford		17.8	143	i 4 16	+ 1	7 38	+ 2	8.7?	10.9
Kew		18.4	142	7 44	?S	(7 44)	- 5	—	9.7
Cowes (I.W.)		18.8	144	4 20	- 7	7 50	- 8	—	—
De Bilt		19.2	131	4 35	+ 4	i 8 15	+ 9	8.6	11.3
Hamburg		19.5	122	e 4 40	+ 5	e 8 11	- 2	e 10.2	14.0
		19.5	122	—	—	i 8 19	+ 6	e 11.0	14.4
Uccle		20.2	134	4 43	0	i 8 26	- 1	i 9.4	10.9
Paris		21.5	140	e 4 55	- 4	i 8 51	- 4	10.7	11.7
Strasbourg		23.1	131	5 17	- 1	i 9 32	+ 5	e 10.7	13.7
Besançon		23.9	136	5 27	0	9 47	+ 5	12.7	—
Zurich		24.4	131	e 5 32	0	i 9 58	+ 6	—	—
Vienna		26.1	120	5 48	- 1	i 10 24	0	e 12.8	15.9
Padova		27.2	129	—	—	—	—	14.7	15.5
Marseilles		27.4	140	e 6 7	+ 5	e 10 44	- 4	e 13.7	16.3
Budapest		27.7	117	—	—	e 10 0	-54	e 13.5	15.7
Lemberg		27.8	109	e 6 20	+14	e 10 50	- 5	—	12.4
Coimbra		27.9	163	5 47	-20	10 46	-11	14.4	16.1
Pola		28.3	127	e 11 1	?S	(e 11 1)	- 3	e 14.7	17.2
Barcelona		28.4	146	—	—	(e 10 34)	-32	e 10.6	16.2
Florence		28.5	131	7 44	+91	—	—	—	16.2
Tortosa		28.6	149	6 8	- 6	10 54	-16	14.3	16.7
Rio Tinto		30.5	161	12 44	?S	(12 44)	+61	—	19.7
Belgrade		30.5	119	i 6 30	- 3	(11 40)	- 3	e 15.2	—
Rocca di Papa		30.8	130	i 6 32	- 4	e 11 32	-16	e 15.7	23.0
Granada		31.5	157	i 6 34	- 9	i 11 49	-11	—	—
San Fernando		31.8	161	6 39	- 6	11 56	- 9	17.2	19.2
Pompeii E.		32.3	133	6 44	- 7	—	—	17.7	—
Algiers		33.1	146	e 6 48	- 9	12 6	-20	15.7	18.2
Northfield		36.4	259	—	—	—	—	e 19.7	—
Ottawa		36.5	262	7 24	- 2	13 6	-11	19.7	—
Athens		37.8	119	—	—	e 13 21	-14	—	—
Toronto		39.4	263	7 2	-48	12 26	-91	i 16.8	23.8
Ithaca		39.4	260	—	—	e 14 2	+ 5	e 20.7	—
Tiflis		42.1	95	e 12 44	?	—	—	—	—
Ann Arbor		42.2	268	7 32	-40	14 38	0	17.6	—
Georgetown N.		42.6	259	8 13	- 2	14 44	+ 1	e 21.0	—
Washington		42.6	259	7 48	-27	14 4	-39	e 19.7	—
Cheltenham N.		42.7	259	—	—	—	—	24.2	25.0
Chicago		44.1	271	8 14	-13	14 22	-41	18.2	26.7
Sitka E.		47.0	319	—	—	—	—	25.3	26.3
Helwan E.		47.6	116	16 44	?S	(16 44)	+55	—	—
St. Louis		47.9	270	—	—	—	—	25.3	28.9
Victoria		51.3	305	—	—	17 16	+41	i 24.8	28.8
Berkeley E.		60.3	299	—	—	e 19 4	+37	31.1	36.7
Tucson E.		61.3	285	—	—	—	—	25.7	34.3
Simla		63.6	73	33 14	?L	—	—	(33.2)	38.1
Zi-ka-wei		76.8	34	e 13 40	+100	—	—	—	—
Kodaikanal		82.8	81	44 2	?L	—	—	53.0	55.3
Honolulu		86.3	323	23 49	?S	(23 49)	+16	43.6	47.0
La Paz		91.4	227	e 9 5	?	10 32	?	42.7	59.3
Manila		92.8	40	—	—	e 23 44	-59	—	59.7

Additional readings: De Bilt gives also MN = $+11.0\text{m}$. Hamburg MZ = $+13.3\text{m}$. Uccle MN = $+12.4\text{m}$. Epicentre $65^{\circ}\cdot6\text{N}$. $22^{\circ}\cdot1\text{W}$. Paris MN = $+10.7\text{m}$. Strasbourg eL = $+11.7\text{m}$. MZ = $+15.5\text{m}$. Marseilles MN = $+15.1\text{m}$. Pola MN = $+16.6\text{m}$. Belgrade gives S as SR₁. Rocca di Papa iPN = $+6\text{m}$.26s. San Fernando MN = $+18.2\text{m}$. Ottawa PR₂ = $+8\text{m}$.48s., SN = $+13\text{m}$.8s., T₀ = 20h.17m.29s. Athens records S as e and gives S = $+23\text{m}$.29s. Toronto iL = $+21.9\text{m}$. eL = $+41.1\text{m}$. Georgetown LE = $+22.7\text{m}$. LN = $+23.2\text{m}$. Washington L = $+24.7\text{m}$. Cheltenham eE = $+25\text{m}$.19s., eN = $+19\text{m}$.49s. Chicago PR₁ = $+10\text{m}$.8s. Helwan PN = $+14\text{m}$.44s. St. Louis eL = $+19.7\text{m}$. Victoria L = $+20.9\text{m}$. eL = $+42.7\text{m}$. Berkeley LV = $+34.7\text{m}$. Honolulu SE = $+31\text{m}$.42s., SR₁E = $+36\text{m}$.11s., MN = $+49.7\text{m}$. La Paz P = $+9\text{m}$.27s. Melbourne ($\Delta = 148^{\circ}\cdot9$) gives simply 21h.

Aug. 23d. Readings also at 1h. (La Paz), 10h. (La Paz, Helwan, De Bilt, Zi-ka-wei, Batavia, Manila, Hamburg, Riverview, and Melbourne), 11h. (Manila and near Tokyo), 13h. (Colombo and Kodaikanal), 14h. and 15h. (Helwan), 18h. (Apia), 19h. (Tiflis), 22h. (Pompeii and near Rocca di Papa), 23h. (Uccle).

Aug. 24d. Readings at 3h. (near Manila), 4h. (near Vera Cruz), 10h. (Taihoku and near Mizusawa and Tokyo), 11h. (Honolulu (2)), 14h. (Chicago), 15h. (La Paz), 16h. (De Bilt and Helwan), 17h. (Mazatlan), 19h. (Zi-ka-wei), 20h. (Manila, Zi-ka-wei, and Riverview), 21h. (Apia), 23h. (near Osaka, Nagasaki, and Zi-ka-wei).

Aug. 25d. Readings at 0h. (near La Paz and near Tokyo), 2h. (Chicago, Ottawa, near Tacubaya, and near Tokyo), 3h. (Manila and near Oaxaca and Tacubaya), 4h. (Chicago and Ottawa), 9h. (Taihoku and Zi-ka-wei), 13h. (Taihoku, Zi-ka-wei, Manila, and De Bilt).

Aug. 26d. Readings at 0h. (near Oaxaca), 1h. (near Colima), 5h. (Zi-ka-wei), 11h. (Manila), 15h. (Colombo), 17h. (Batavia), 18h. (near Tokyo).

Aug. 27d. Readings at 1h. (La Paz), 2h. (Helwan), 4h. (Nagasaki), 7h. (La Paz), 8h. (near Ottawa), 10h. (La Paz), 20h. (Uccle, Zi-ka-wei, and near Sapporo, Hakodate, Mito, Tyosi, and Tokyo).

Aug. 28d. Readings at 5h. (near Rocca di Papa (2)), 8h. (La Paz), 9h. (Helwan), 10h. (Pompeii and near Rocca di Papa (3)), 11h. (near Sapporo, Mizusawa, Hakodate, Tyosi, and Tokyo), 12h. (near Rocca di Papa), 16h. and 18h. (2) (La Paz), 19h. (Helwan, De Bilt, and Uccle), 20h. (La Paz, De Bilt, and Uccle), 21h. (Helwan).

Aug. 29d. 19h. 4m. 10s. Epicentre $40^{\circ}0'N$. $92^{\circ}0'W$.

$A = -.027$, $B = -.766$, $C = +.643$; $D = -.999$, $E = +.035$;

$G = -.022$, $H = -.642$, $K = -.766$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Chicago	3.8	62	1 2	+ 3	1 37	- 7	1.7	—
Ann Arbor	6.7	67	—	—	—	—	3.5	—
Georgetown	11.6	91	—	—	e 5 5	- 4	—	—
Washington	11.6	91	—	—	e 4 50	-19	—	—
Ottawa	13.1	60	e 1 37	?	—	—	e 6.5	—
Tucson	E. 17.0	249	4 2	- 3	—	—	4.9	5.4
Honolulu	E. 58.4	272	e 10 9	+ 8	—	—	—	—

Additional readings and notes: Ottawa gives also $L = +6.8m$. Tucson readings have been increased by 12min. Honolulu eN = +9m.30s.

Aug. 29d. Readings also at 2h. (near La Paz), 7h. (near Athens), 8h. (Helwan and La Paz), 9h. (De Bilt), 11h. and 14h. (La Paz), 15h. (Helwan, La Paz Manila, and near Hokoto and Taihoku), 22h. (near Tokyo).

Aug. 30d. Readings at 10h. (near Tokyo), 13h. (La Paz), 16h. (Manila), 19h. (La Paz and Taihoku), 22h. (Nagasaki), 23h. (Osaka and Zi-ka-wei).

Aug. 31d. 21h. 3m. 0s. Epicentre $40^{\circ}0'N$. $136^{\circ}5'E$ (as on 1921 Jan. 9d.).

A = -0.556, B = +0.527, C = +0.643; D = +0.688, E = +0.725;

G = -0.466, H = +0.442, K = -0.766.

A very doubtful epicentre. Possibly two shocks.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Osaka		5.4	190	1 20	- 3	(2 30)	+ 2	2.5	3.1
Nagasaki		9.0	218	6 25	?L	—	—	(6.4)	—
Zi-ka-wei	z.	15.1	239	4 15	+35	e 6 15	-19	—	7.6
Hamburg		75.8	331	e 28 0	?	—	—	i 36.0	—
Vienna		77.1	325	—	—	—	—	e 30.0	30.5
Edinburgh		78.2	340	—	—	—	—	33.0	—
De Bilt		78.7	332	—	—	—	—	e 31.0	34.2
Eskdalemuir		78.7	340	—	—	—	—	31.0	—
Stonyhurst		79.7	337	e 36 30	?L	—	—	(e 36.5)	—
Uccle		80.0	332	—	—	e 24 36	+133	e 30.0	—
Bidston		80.3	337	—	—	—	—	34.4	37.3
Strasbourg		80.6	329	—	—	—	—	e 33.0	—
Kew		81.1	336	—	—	—	—	—	41.0
Helwan	E.	81.6	303	32 0	?	—	—	—	—
Paris		82.4	333	—	—	—	—	e 34.0	37.0
Rocca di Papa		83.7	323	—	—	—	—	e 33.5	41.5

Additional readings: Hamburg gives also iN = +31m.30s. and +32m.0s.
De Bilt MN = +34.0m. Helwan PN = +27m.0s.

Aug. 31d. Readings also at 8h. (Manila), 13h. (near Tokyo), 20h. (near Tokyo and Mizusawa), 22h. (near Tokyo and Mizusawa).

Sept. 1d. Readings at 0h. (near Lick), 6h. (near Tokyo), 10h. (Hamburg, Helwan, Kodaikanal, Edinburgh, Eskdalemuir, Uccle, and De Bilt), 12h. (Simla), 15h. (Oxford, Kew, Hamburg, Edinburgh, Eskdalemuir, De Bilt, Uccle, and Helwan), 17h. (near Nagasaki), 21h. and 22h. (Taihoku).

Sept. 2d. 9h. 41m. 20s. Epicentre $42^{\circ}4'N$. $21^{\circ}4'E$. (suggested by Belgrade).

A = +0.688, B = +0.269, C = +0.674; D = +0.365, E = -0.931;

G = +0.628, H = +0.246, K = -0.738.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Belgrade		2.5	344	e 0 34	- 5	1 37	?L	(1.6)	2.0
Sarajevo		2.6	304	e 0 48	+ 7	1 30	?L	(1.5)	1.6
Rocca di Papa		6.4	262	e 1 31	- 7	—	—	—	2.9
Padova		7.5	297	3 56	?L	—	—	(3.9)	—
Strasbourg		11.3	308	—	—	—	—	e 6.1	—
Paris		14.6	303	—	—	e 0 16	?	4.7	17.7
De Bilt		14.6	317	—	—	—	—	e 8.1	—

Additional readings: Belgrade gives iP = +40s. Sarajevo P = +59s.
Rocca di Papa eN = +1m.34s. Padova PR₁ = +6m.3s.

Sept. 2d. Readings also at 0h. (La Paz and Adelaide), 1h. (La Paz), 5h. (Kodaikanal), 9h. (Paris), 12h. (Dehra Dun), 18h. (near Apia), 23h. (Algiers).

Sept. 3d. 8h. 57m. 50s. Epicentre $32^{\circ}5'N$. $143^{\circ}0'E$.

A = -0.673, B = +0.508, C = +0.537; D = +0.602, E = +0.799;

G = -0.429, H = +0.323, K = -0.843.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo		4.1	320	i 0 59	- 5	i 1 14	-39	1.8	3.0
Osaka		6.6	291	1 41	0	—	—	3.7	5.8
Kobe		6.8	291	1 39	- 5	2 53	-12	3.9	7.2
Mizusawa	E.	6.8	348	1 45	+ 1	2 53	-12	—	—
Nagasaki	N.	6.8	348	1 42	- 2	3 0	- 5	—	—
		11.0	275	2 57	+13	—	—	—	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari		14.2	359	6 53	?S	(6 53)	+40	10.1	—
Zi-ka-wei		18.3	272	e 4 16	-5	e 7 49	+2	—	—
Taihoku		20.1	254	e 5 38	+56	—	—	—	—
Manila		26.8	233	e 6 10	+14	—	—	—	—
Honolulu	E.	53.1	87	17 21	?S	(17 21)	+24	25.2	25.7
	N.	53.1	87	17 41	?S	(17 41)	+44	—	25.4
Hamburg		84.8	334	e 13 10	+23	e 23 10	-7	e 45.2	51.2
Budapest		85.5	326	—	—	—	—	e 42.2	—
Edinburgh		87.0	342	—	—	i 23 34	-7	—	—
Eskdalemuir		87.5	342	e 12 58	-4	e 23 40	-7	43.7	—
De Bilt		87.7	335	—	—	23 33	-16	e 46.2	52.7
Uccle		89.0	335	—	—	e 23 31	-32	e 45.2	—
Bidston		89.2	340	—	—	—	—	47.2	59.2
Strasbourg		89.6	331	—	—	e 23 35	-35	51.2	62.2
Helwan	N.	90.2	306	24 10	?S	(24 10)	-6	—	—
Rocca di Papa		92.8	325	e 13 22	-9	e 17 4	?PR ₁	e 49.6	—
Coimbra		102.6	338	—	—	e 24 10	-130	e 55.2	—
La Paz		147.7	66	20 7	[+15]	—	—	—	—

Additional readings and notes : Tokyo S has been increased by 1min. Osaka gives also MN = +5.7m. Kobe MN = +7.4m. Honolulu SN = +22m.36s. Hamburg MN = +56.2m. De Bilt MN = +56.1m. Helwan PE = +29m.10s. Rocca di Papa e = +6m.34s.

Sept. 3d. Readings also at 0h. (Manila), 1h. (Kodaikanal and De Bilt), 19h. (La Paz), 20h. (Florence), 21h. (near Mizusawa).

Sept. 4d. Readings at 0h. (Manila), 3h. and 7h. (La Paz), 23h. (Honolulu).

Sept. 5d. 17h. 54m. 53s. Epicentre 22°0N. 123°5E. (as on 1920 Dec. 17d.).

$$A = -512, B = +773, C = +375; \quad D = +834, E = +552; \\ G = -207, H = +312, K = -927.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku		3.5	330	0 39	-16	—	—	1.1	1.2
Hokoto		4.0	293	1 0	-2	—	—	1.3	1.3
Manila		7.8	198	e 2 7	+9	—	—	—	—
Zi-ka-wei		9.4	348	e 2 20	-2	e 4 10	-3	—	4.5
De Bilt		88.6	328	—	—	e 23 15	-44	e 47.1	49.4
Uccle		89.7	327	—	—	—	—	e 47.1	—

De Bilt gives also MN = +49.6m.

1921. Sept. 5d. 19h. 56m. 54s. Epicentre 47°3N. 151°5E.

$$A = -596, B = +324, C = +735; \quad D = +477, E = +879; \\ G = -646, H = +351, K = -678.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari		6.0	267	2 45	?S	(2 45)	+1	4.0	4.8
Mizusawa	E.	11.1	226	2 44	-2	5 59	+62	—	—
	N.	11.1	226	2 43	-3	5 53	+56	—	—
Tokyo		14.5	221	i 3 9	-27	(6 32)	+12	6.5	7.7
Osaka		17.4	230	4 11	+1	7 46	+19	9.4	10.9
Kobe	N.	17.6	230	i 4 7	-5	i 8 37	+66	10.8	11.3
Nagasaki		21.9	236	e 5 4	0	(9 9)	+6	9.2	15.4
Zi-ka-wei		28.0	246	e 5 59	-9	10 47	-12	e 13.5	16.2
Taihoku		32.5	237	11 58	?S	(11 58)	-18	17.8	20.2
Manila		41.4	229	e 7 51	-15	(14 6)	-21	14.1	14.8
Sitka	E.	43.6	50	—	—	—	—	e 27.4	31.8
Honolulu	E.	48.0	104	5 4	?	i 15 42	-12	32.5	36.4
	N.	48.0	104	—	—	—	—	32.9	33.6

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Victoria	54.1	55	—	—	16 22	-48	20.8	31.8
Simla	57.5	282	e 16 12	?S	(e 16 12)	-101	31.6	35.1
Berkeley	60.9	65	e 10 20	+ 2	e 18 27	- 8	28.4	29.9
Lick	61.7	65	—	—	—	—	e 28.0	—
Batavia	66.4	230	e 10 50	- 4	i 19 42	0	e 37.1	—
Bombay	68.7	276	38 5	?L	—	—	(38.1)	—
Tiflis	69.9	310	—	—	e 21 6	+41	—	—
Kodaikanal	71.7	268	21 18	?S	(21 18)	+32	39.3	48.2
Colombo	72.5	263	30 6	?L	38 6	?L	(38.1)	56.1
Lemberg	72.8	327	e 11 48	+ 3	—	—	e 36.2	49.7
Dyce	73.2	347	i 11 56	+19	i 21 28	+24	39.1	44.3
Hamburg	74.0	338	e 11 45	+ 3	e 21 21	+ 7	e 35.3	42.8
Edinburgh	74.7	347	(11 41)	- 6	i 21 24	+ 2	35.1	44.9
Eskdalemuir	75.2	347	e 12 6	+16	i 21 11	-17	33.1	43.1
Stonyhurst	76.4	345	e 16 48	?PR ₁	21 48	+ 6	31.1	53.1
De Bilt	76.5	340	11 59	+ 1	21 45	+ 2	e 40.1	44.6
	76.5	340	—	—	—	—	e 41.1	44.8
Budapest	76.6	330	e 11 47	-12	21 41	- 3	37.1	39.1
Chicago	76.7	41	11 51	- 8	22 26	+41	35.8	—
Vienna	76.8	332	12 0	0	e 21 6	-41	e 37.1	46.6
Uccle	77.9	340	e 12 8	+ 2	e 21 54	- 5	e 34.1	45.4
Ann Arbor	78.2	38	—	—	—	—	e 46.5	—
Oxford	78.3	345	11 46?	-23	i 22 1	- 3	31.4	47.5
Belgrade	78.4	327	e 12 5	- 4	e 22 5	0	e 26.8	50.4
Ottawa	78.5	31	—	—	e 21 59	- 7	40.5	—
Toronto	78.6	35	—	—	—	—	37.7	54.0
Strasbourg	79.1	337	i 12 14	0	e 22 31	+18	e 38.1	47.2
Zurich	80.0	336	e 12 20	+ 1	—	—	e 39.1	—
Paris	80.2	341	i 12 22	+ 2	i 22 21	- 4	36.1	46.1
Northfield	80.6	30	—	—	—	—	e 42.1	—
Pola	80.6	332	e 12 26	+ 3	e 22 38	- 8	e 40.6	49.4
Besançon	80.8	338	12 24?	0	22 42	+ 9	39.1	—
Riverview	81.1	180	e 12 46	+20	e 22 31	- 5	34.3	35.1
Sydney	81.1	180	22 18	?S	(22 18)	-18	42.3	44.6
Moncalieri	82.4	336	12 28	- 4	22 34	-16	38.5	49.6
Georgetown	83.5	37	—	—	22 56	- 7	45.7	—
Washington	83.5	37	12 33	- 6	22 55	- 8	41.8	—
Cheltenham N.	83.8	37	—	—	—	—	39.4	61.6
Rocca di Papa	83.8	330	12 42	+ 1	22 44	-23	e 41.3	55.1
Pompeii	84.0	329	13 6	+24	—	—	44.1	—
Marseilles	84.6	337	e 12 56	+10	—	—	e 33.1	—
Melbourne	85.3	185	—	—	e 23 0	-22	35.4	43.7
Helwan	86.0	312	14 48	?	—	—	—	57.5
	86.0	312	14 18	?	—	—	—	60.6
Barcelona	87.2	338	—	—	23 22	-21	e 40.2	50.4
Tortosa	88.2	339	12 55	-11	23 24	-30	40.6	53.8
Coimbra	90.8	346	e 13 21	+ 1	23 47	-35	e 39.1	59.4
Algiers	91.3	335	e 11 22	-121	—	—	e 37.1	51.1
San Fernando	93.9	343	—	—	—	—	54.3	58.3
La Paz	135.2	60	19 29	[- 1]	29 2	?	73.4	81.3
Cape Town	142.5	274	80 29	?L	—	—	(80.5)	—

Additional readings: Ootomari gives also MN = +4.2m. Tokyo S = +4m.16s. Osaka MN = +11.1m. Zi-ka-wei MN = +17.5m. Taihoku S = +15m.7s. Manila S = +12m.6s., MN = +16.1m. Sitka eE = +31m.22s. Honolulu iPR₁ = +8m.42s., PR₂N = +10m.36s., PSN = +16m.24s., SR₁E = +22m.9s., SR₁N = +21m.51s. Simla MN = +31.9m. Berkeley eN = +27m.27s., eLV = +29.4m. Batavia iE = +20m.35s. Hamburg SR₂ = +29m.48s., MZ = +46.4m., MN = +53.4m. Edinburgh gives its P as a preliminary reading. Stonyhurst P = +26m.54s. Uccle e = +18m.6s., MN = +45.6m. Ann Arbor LE = +39.7m. and 51.0m.; also for Weichert LE = +51.2m., LN = +45.9m. Ottawa e?E = +17m.38s., e?N = +26m.47s., e = N = +28m.19s., eL?E = +31.6m. Toronto e = +30m.30s., iL = +43.3m., eL = +45.4m., iL = +53.7m. Strasbourg SR₁ = +27m.16s., e = +35m.35s., MN = +48.5m. Paris MN = +56.1m. Northfield L = +48.1m. Pola M = +50.5m. Riverview eS = +23m.4s. MN = +43.9m. Moncalieri MN = +52.7m. Georgetown eLE? = +38.2m., LN = +50.2m., LE = +51.4m. Washington L = +58.4m. Barcelona SR₂ = +35m.43s. Coimbra MN = +58.4m., T₀ = 19h.57m.46s. San Fernando MN = +58.8m.

Sept. 5d. Readings also at 0h. (De Bilt and Uccle), 7h. (La Paz), 12h. (near Mizusawa, Sapporo, and Hakodate), 15h. (Taihoku), 19h. (Edinburgh), 22h. (Berkeley), 23h. (near Mostar, Sarajevo, and Belgrade).

Sept. 6d. Readings at 2h. (Wellington), 4h. (Zi-ka-wei, Wellington (2), Taihoku, De Bilt, Uccle, and Riverview), 5h. (Helwan), 9h. (near Tokyo and Mizusawa), 11h. (near Mizusawa), 12h. (near Batavia), 13h. (Wellington).

Sept. 7d. 22h. 28m. 50s. Epicentre $33^{\circ}8'N$. $140^{\circ}5'E$. (as on 1920 July 20d.).

$A = -.641$, $B = +.528$, $C = +.556$; $D = +.636$, $E = +.772$;
 $G = -.429$, $H = +.354$, $K = -.831$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	2.0	342	i 0 29	- 2	0 55	0	1.2	1.3
Osaka	4.3	284	1 10	+ 3	—	—	—	1.7
Mizusawa E.	5.3	5	1 16	- 6	2 26	+ 1	—	—

Additional readings: Osaka gives also $MN = +1.5m$. Mizusawa $SN = +2m.27s$.

Sept. 7d. Readings also at 9h. (Apia), 13h. (near Tokyo), 19h. (La Paz), 21h. (Algiers, Helwan, De Bilt, Uccle).

Sept. 8d. 19h. 23m. 45s. Epicentre $33^{\circ}6'N$. $116^{\circ}4'W$. (as on 1919 Oct. 1d.).

$A = -.370$, $B = -.746$, $C = +.553$; $D = -.896$, $E = +.445$;
 $G = -.246$, $H = -.496$, $K = -.833$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Point Loma	1.1	219	0 15	- 2	—	—	—	—
Tucson E.	4.8	104	0 55	-19	1 32	-39	1.8	2.0
Lick E.	4.8	104	1 4	-10	—	—	—	2.2
Victoria	5.5	310	1 40	+15	3 5	+34	3.5	3.9
St. Louis	15.7	343	—	—	—	—	8.2	9.7
Chicago	21.6	69	—	—	—	—	i 11.2	—
Ann Arbor E.	24.0	62	2 40	?	7 0	?	12.5	—
Georgetown N.	27.0	62	—	—	—	—	16.8	—
Washington	31.9	69	e 5 35	-71	—	—	e 15.6	—
Ithaca	32.3	62	—	—	—	—	e 16.8	—
Ottawa	33.1	57	—	—	—	—	i 17.2	—
Honolulu	38.7	263	—	—	—	—	e 16.7	20.8
Edinburgh	74.1	32	—	—	—	—	—	42.2
Eskdalemuir	74.4	33	—	—	e 24 15	+176	38.2	—
De Bilt	80.3	32	—	—	e 17 44	?SR ₁	e 39.2	46.8
Uccle	80.8	33	—	—	—	—	e 41.2	—

Additional readings and notes: Point Loma reading has been reduced by 30min. Lick $eN = +2m.19s$. St. Louis $L = +13.2m$. Ann Arbor $LN = +17.0m$. Ithaca $e = +17m.45s$. and $+19m.50s$. Ottawa $i = +17m.23s$. $iN = +17m.41s$. and $+18m.17s$. $eLE = +20.0m$. $LE = 21.2m$. Honolulu $eN = +17m.18s$. $MN = +18.2m$.

Sept. 8d. Readings also at 3h. (near Cape Town), 11h. (Tiflis), 18h. (near Tokyo and Zi-ka-wei), 19h. (near Nagasaki—possibly given one hour late).

Sept. 9d. 12h. 22m. 44s. Epicentre $42^{\circ}5'N$. $3^{\circ}0'E$.

$A = +.736$, $B = +.039$, $C = +.676$.

	Δ	P.	O-C.	L.	M.
	$^{\circ}$	m. s.	s.	m.	m.
Barcelona	1.3	0 18	- 2	0.5	1.0
Marseilles	1.9	0 32	+ 3	—	—
Tortosa	2.5	0 38	- 1	1.5	2.0
Strasbourg	6.9	—	—	e 3.6	—
De Bilt	9.7	—	—	e 6.2	—

No additional readings.

Sept. 9d. Readings also at 2h. (near Mizusawa), 8h. (Helwan), 9h. (near Mizusawa), 23h. (Vienna and Tiflis).

Sept. 10d. Readings at 1h. (Manila (2)), 5h. (Marseilles), 10h. (Manila), 11h. and 15h. (Nagasaki), 16h. (Oaxaca), 23h. (Colima and Mazatlan).

1921. Sept. 11d. 4h. 1m. 30s. Epicentre 11°5S. 112°0E.

A = -·367, B = +·909, C = -·199; D = +·927, E = +·375;

G = +·075, H = -·185, K = -·980.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	7·3	316	i 1 46	- 5	3 8	-10	—	—
Manila	27·6	19	e 6 13	+ 9	11 39	+47	15·5	—
Hokoto	35·8	12	7 56	+36	—	—	8·3	—
Colombo	36·9	299	6 30	-59	—	—	—	26·5
Taihoku	37·7	16	e 7 30	- 6	13 29	- 5	19·9	22·7
Melbourne	39·5	138	7 18	-33	13 24	-35	18·7	22·0
Kodaikanal	40·6	303	(7 30)	-30	—	—	7·5	26·2
Calcutta	41·2	328	7 54	-11	13 42	-42	17·5	—
Riverview	42·1	130	e 8 5	- 7	i 14 30	- 6	e 17·7	26·0
Sydney	42·1	130	8 12	0	14 30	- 6	21·5	28·5
Zi-ka-wei	43·6	14	e 8 12	-11	e 13 46	-70	17·6	26·8
Nagasaki	47·4	21	8 40	-10	15 31	-15	19·3	33·2
Hukuoka	48·4	22	9 58	+62	15 20	-39	22·6	28·6
Bombay	49·1	310	8 46	-15	16 5	- 2	—	—
Zinsen	50·8	16	6 4	-188	13 14	-195	20·2	29·2
Osaka	51·2	26	9 18	+ 4	16 21	-13	23·3	30·7
Tokyo	54·0	30	i 9 33	0	15 53	-76	23·0	25·5
Simla	54·1	324	8 30	-64	16 30	-40	23·5	—
Mito	54·9	31	9 32	- 6	17 2	-18	23·5	32·2
Mizusawa	57·4	29	9 56	+ 1	17 43	- 8	—	—
Hakodate	59·4	26	e 10 14	+ 6	(18 27)	+11	18·4	18·9
Wellington	62·1	132	10 48	+22	19 24	+35	31·9	41·6
Ootomari	64·3	24	10 40	0	(19 11)	- 6	19·2	40·8
Apia	74·2	102	e 11 53	+10	21 42	+26	41·6	44·5
Tiflis	81·3	316	15 0	?PR ₁	25 36	?	—	43·5
Cape Town	86·5	237	12 53	- 3	23 33	- 3	—	23·9
Helwan	87·8	302	12 48	-16	—	—	—	61·6
	87·8	302	11 42	-82	—	—	—	60·0
Honolulu	94·6	70	13 33	- 8	24 30	-32	44·4	49·3
	94·6	70	13 38	- 3	24 54	- 8	38·3	41·8
Athens	95·7	308	13 9	-38	i 25 0	-13	e 43·5	53·7
Lemberg	97·4	320	e 13 42	-14	e 24 18	-72	e 54·3	66·2
Belgrade	99·2	315	i 13 56	-10	(24 23)	-85	41·2	61·1
Budapest	100·4	318	e 13 36	-37	23 0	-180	e 41·5	42·5
Vienna	102·2	319	13 55	-26	24 52	-85	e 43·5	64·5
Pompeii	103·1	311	14 34	+ 8	18 44	?PR ₁	32·5	63·5
Pola	103·8	315	e 14 19	-10	e 25 19	-72	e 43·3	73·3
Rocca di Papa	104·5	312	e 14 12	-20	23 54	-164	e 45·0	—
Padova	105·2	315	15 11	+36	26 8	-36	—	72·6
Florence	105·6	314	13 30	-67	26 30	-18	—	53·5
Hamburg	106·3	324	e 14 19	-22	—	—	45·0	60·5
Zurich	107·5	316	e 15 0	+14	e 25 5	-121	—	—
Strasbourg	108·0	319	e 14 28	-20	e 25 38	-92	e 44·5	70·2
Moncalieri	108·1	315	e 14 39	-10	25 40	-91	44·3	75·2
Besançon	109·2	317	18 58	?PR ₁	—	—	38·5	—
De Bilt	109·4	322	e 14 40	-15	e 25 49	-94	e 48·5	70·3
Marseilles	109·9	313	e 18 22	?PR ₁	29 4	+97	e 45·5	62·1
Ucele	110·0	321	e 14 30	-27	i 26 4	-84	e 44·5	61·1
Paris	111·4	318	e 15 4	0	e 25 41	-120	44·5	67·5
Sitka	111·8	32	—	—	e 29 15	+91	52·0	54·8
Algiers	111·9	305	e 14 49	-18	25 53	-112	45·5	57·5
Barcelona	112·4	310	e 17 48	+159	28 52	+63	e 42·6	65·1
Dyce	112·6	328	i 19 51	?PR ₁	26 3	-108	—	63·5
Kew	112·8	321	19 30	?PR ₁	—	—	—	74·5
Oxford	113·1	321	i 19 30	?PR ₁	—	—	50·7	75·5
Stonyhurst	113·5	322	19 30	?PR ₁	—	—	—	74·5
Edinburgh	113·5	326	19 52	?PR ₁	27 41	-17	36·5	61·5

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Eskdalemuir E.	113.6	326	e 15 0	-14	i 19 30	? PR ₁	—	—
Tortosa	113.6	310	18 32	[- 1]	29 38	+99	46.2	69.0
Bidston	114.0	322	19 44	?PR ₁	—	—	45.5	60.5
Granada	117.2	306	i 19 8	[+23]	i 30 28	+120	—	—
San Fernando	119.4	305	19 24	[+33]	30 24	+99	66.7	89.0
Rio Tinto	119.5	307	23 30	?PR ₁	—	—	—	94.5
Coimbra	120.5	310	e 15 31	-14	e 29 34	+41	52.0	84.9
Victoria	121.2	40	13 49	?	20 12	?PR ₁	i 80.2	87.1
	121.2	40	(19 10)	[+14]	(29 49)	+51	29.8	61.8
Berkeley	125.0	50	19 10	[+ 4]	e 20 52	?PR ₁	—	55.7
Lick	E. 125.6	51	e 21 25	?PR ₁	—	—	—	39.0
Tucson	E. 135.5	53	e 19 39	[+ 8]	e 23 40	?PR ₁	e 72.8	75.2
Denver	E. 136.8	41	(e 17 30)	?	—	—	—	26.5
Rio de Janeiro	137.9	215	e 22 30	?PR ₁	—	—	41.0	42.3
Chicago	145.2	26	i 19 38	[-10]	—	—	33.4	—
Ottawa	145.4	8	i 19 45	[- 4]	e 32 19	?	e 59.5	—
Ann Arbor	E. 146.3	20	19 48	[- 2]	33 54	?	71.9	83.3
	N. 146.3	20	20 0	[+10]	33 42	?	72.2	84.6
St Louis	146.4	31	19 54	[+ 4]	25 12?	?PR ₁	72.1	88.8
Toronto	146.4	13	i 20 24	[+34]	—	—	e 79.7	113.7
Northfield	147.1	5	i 19 50	[- 1]	—	—	68.5	—
Ithaca	148.2	10	20 14	[+21]	—	—	64.0	—
Tacubaya	149.0	71	20 1	[+ 7]	—	—	20.5	20.7
Fordham	E. 150.2	9	20 10	[+14]	24 6	?PR ₁	—	74.5
Georgetown	E. 151.4	13	e 20 3	[+ 5]	31 7	?	71.5	—
	N. 151.4	13	i 20 5	[+ 7]	31 17	?	69.8	—
Washington	151.4	13	i 20 18	[+20]	—	—	34.2	—
Cheltenham	N. 151.6	15	i 19 59	[+ 1]	e 24 9	?PR ₁	e 49.4	93.4
Vera Cruz	151.8	71	79 37	?L	—	—	(79.6)	—
La Paz	152.0	180	e 20 5	[+ 6]	34 19	?	74.5	89.2
	152.0	180	i 20 14	[+15]	34 39	?	—	78.7
Porto Rico	N. 172.8	340	e 25 36	?PR ₁	e 29 52	?	e 57.8	59.5

Additional readings and notes : Batavia gives also $i = +2m.31s.$, $T_0 = 4h.1m.24s.$
 Epicentre $12^{\circ}48'. 110^{\circ}8'E.$ Melbourne $PR_1 = +8m.24s.$, $PR_2 = +8m.54s.$,
 $SR_1 = +15m.42s.$, $SR_2 = +16m.36s.$ Riverview $iP = +8m.7s.$ and
 $8m.35s.$, $iS = +15m.4s.$, $SR_1 = +17m.3s.$, $SR_2 = +18m.4s.$, $SR_3 = +18m.25s.$
 and $+18m.37s.$, $MN = +22.3m.$, $MZ = +31.5m.$, $T_0 = +4h.1m.25s.$ Epicentre
 $13^{\circ}08'. 111^{\circ}0'E.$ Sydney $PR_2 = +10m.0s.$, $SR_1 = +17m.12s.$ Zi-ka-wei
 $PMN = +10m.34s.$, $PSE = +15m.5s.$, $PSN = +15m.6s.$, $SR_1E = +17m.0s.$,
 $MN = +25.0m.$ Nagasaki $MN = +32.6m.$ Hukuoka $MN = +33.2m.$
 Osaka $MN = +29.6m.$ Mizusawa $PN = +9m.54s.$ Wellington $SR_1 =$
 $+23m.54s.$ Apia $eP = +12m.1s.$ and $+12m.54s.$, $T_0 = 4h.1m.33s.$
 Epicentre $12^{\circ}08'. 111^{\circ}0'E.$ All readings given as at 3h. Honolulu $PR_1E =$
 $+17m.40s.$, $PR_1N = +17m.48s.$, $SR_1N = +30m.50s.$ Athens $i = +17m.13s.$,
 $PR_1 = +17m.54s.$, $PR_2 = +20m.13s.$, $i = +24m.9s.$, $eSN = +24m.53s.$, $SR_1N =$
 $+31m.36s.$, $MN = +62.6m.$ Belgrade $iS = +18m.0s.$ ($?PR_1$), S is given
 as SR_1 , $eL = +30.0m.$, $L = +66.9m.$ Budapest $i = +17m.55s.$, $e =$
 $+31m.30s.$ Vienna $iE = +17m.23s.$, $+17m.55s.$, and $+18m.12s.$, $iZ =$
 $+18m.13s.$, $MN = +48.0m.$, $MZ = +70.0m.$, Pola $MN = +62.4m.$
 Rocca di Papa $e = +14m.0s.$, $PR_1 = +17m.33s.$ and $+18m.48s.$, and several
 other readings. Padova $PR_1 = +19m.39s.$, $SR_1 = +26m.26s.$ Florence
 $P? = +15m.54s.$, $S? = +28m.33s.$ Hamburg $i = +18m.36s.$, $+25m.27s.$,
 $+29m.29s.$, $+33m.46s.$, and $+37m.40s.$, $LE = +49.5m.$, $LZ = +51.5m.$,
 $MZ = +52.5m.$, $MN = +53.5m.$ Strasbourg $MN = +63.7m.$ Moncalieri
 $MN = +67.5m.$ De Bilt $PR_1E = +18m.55s.$, $MN = +71.8m.$, $T_0 =$
 $4h.1m.24s.$? Epicentre $12^{\circ}48'. 110^{\circ}8'E.$ Marseilles $MN = +45.8m.$
 Uccle $PR_1 = +19m.12s.$, $e = +27m.7s.$, $i = +28m.40s.$, $SR_1 = +34m.45s.$,
 $MN = +66.9m.$ Paris $e = +19m.29s.$, $e = +28m.54s.$, $MN = +47.5m.$
 Algiers $PR_1 = +19m.34s.$, $PR_2 = +22m.11s.$ Barcelona $? = +19m.37s.$
 Dyce $SE = +26m.11s.$? Edinburgh $PR_1 = +22m.24s.$, $PR_2 = +23m.5s.$
 Coimbra $iSM = +30m.54s.$, $L = +64.5m.$, $MN = +79.5m.$, $T_0 = 4h.1m.32s.$
 Victoria $L = +27.6m.$, $iL = +84.8m.$ and $+89.6m.$, $eL = +118.6m.$
 Berkeley $MV = +61.1m.$ Denver $LN = +25.5m.$ All readings are given as
 for 3h. and increased by 1h. in the table. Ottawa $L = +63.5m.$ St. Louis
 $L = +35.87m.$, $+63.9m.$, and $+68.4m.$, $MN = +90.8m.$ Toronto $i =$
 $+23m.36s.$, $e = +27m.24s.$ and $+33m.54s.$, $i = +37m.12s.$, $L = +39.0m.$,
 $iL = +51.7m.$, $eL = +61.2m.$ Northfield $L = +66.5m.$ and $+91.5m.$
 Ithaca $PR_1 = +23m.48s.$, $L = +86.5m.$ Fordham $PN = +20m.2s.$
 Georgetown $eLEN = +49.6m.$, $LE = +88.5m.$ Cheltenham a possible
 $L = +79.3m.$ La Paz $i = +49m.49s.$ and $+50m.30s.$, $L(rep) = +100.1m.$
 Porto Rico $eE = +26m.5s.$

Sept. 11. Readings also at 8h. (Batavia and Tiflis), 11h. and 12h. (Batavia), 13h. (Kobe), 14h. (near Tacubaya), 15h. (Batavia), 16h. (Manila and Batavia), 19h. (La Paz and near Mizusawa), 21h. (Manila and Batavia).

Sept. 12d. 0h. 24m. 52s. Epicentre $45^{\circ}0'N$. $11^{\circ}5'E$. (as on 1920 Feb. 28d.).

A = +.693, B = +.141, C = +.707 ; D = +.199, E = -.980 ;
G = +.693, H = +.141, K = -.707.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Padova	0.5	33	0 5	- 3	0 11	- 3	0.4	0.8
Pola	1.7	95	0 9	-17	—	—	e 1.0	1.1
Chur	2.3	324	i 0 36	0	0 50	-13	—	—
Zurich	3.1	322	e 0 50	+ 1	i 1 29	+ 3	—	1.5
Rocca di Papa E.	3.4	164	e 1 34	?S	(1 34)	0	—	3.0
Strasbourg	4.4	326	e 1 13	+ 5	2 5	+ 4	—	—

Additional readings: Padova gives also $SR_1 = +47s$. Zurich gives readings for all three components not materially different from the above. Rocca di Papa ePN = +1m.20s., MN = +1.5m., LN = +5.5m. Algiers ($\Delta = 10^{\circ}4$) gives just 0h.25m.

Sept. 12d. 5h. 9m. 48s. Epicentre $18^{\circ}0'N$. $97^{\circ}0'E$. (as on 1919 Sept. 8d.).

A = -.116, B = +.944, C = +.309 ; D = +.993, E = +.122 ;
G = -.038, H = +.307, K = -.951.

If the Calcutta readings may be taken 6min. too large, this solution will satisfy the observations. If not, the epicentre must be moved some 10° further from Calcutta.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Calcutta E.	9.3	300	8 0	?	—	—	10.6	—
Manila	23.2	87	—	—	—	—	e 11.3	—
Taihoku	23.8	69	—	—	—	—	e 12.0	—
Zi-ka-wei	25.7	55	e 5 46	+ 1	e 10 14	- 2	—	13.4
Helwan	60.4	295	33 12	?L	—	—	(33.2)	—
De Bilt E.	77.0	321	—	—	—	—	e 38.2	44.3
N.	77.0	321	—	—	—	—	e 36.2	38.2
Kew	80.4	321	—	—	—	—	—	47.2
Eskdalemuir	80.9	326	—	—	—	—	35.2	—
Tortosa	83.1	312	—	—	—	—	e 40.2	43.7

Additional readings: Zi-ka-wei gives also $MZ = +12.7m$., $MN = +13.7m$. Helwan PN = +38m.12s.

Sept. 12d. 23h. 23m. 42s. Epicentre $56^{\circ}0'N$. $153^{\circ}0'E$.

A = -.498, B = +.254, C = +.829 ; D = +.454, E = +.891 ;
G = -.739, H = +.376, K = -.559.

Very rough.

	Δ	Az.	P.	O - C.	S.	O - C.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.
Mizusawa E.	18.6	210	4 36	+12	8 13	+20
N.	18.6	210	4 33	+ 9	8 11	+18
Zi-ka-wei	33.2	235	7 2	+ 4	12 56	+29
Batavia	72.8	230	—	—	i 20 58	- 2
Tortosa	80.4	340	12 18	- 3	—	—
Helwan	80.9	312	—	—	22 18	-16
Granada	84.7	342	i 12 44	- 2	23 44	+28

Additional readings: Helwan gives also $SN = +24m.18s$. Granada Y = +22m.56s.

Sept. 12d. Readings also at 5h. (near Mizusawa), 6h. (near Belgrade), 9h. (Tiflis), 13h. (Batavia), 14h. (Batavia, near Nagasaki, and near Mizusawa), 15h. (Manila), 16h. (Tiflis), 18h. (Florence), 19h. (Batavia).

1921. Sept. 13d. 2h. 36m. 40s. Epicentre 55° OS. 27° 5W.

A = +.509, B = -.265, C = -.819; D = -.462, E = -.887;
G = -.727, H = +.378, K = -.574.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Rio de Janeiro	E.	34.2	335	e 7 8	+ 1	12 2	-41	16.2	18.9
	N.	34.2	335	e 7 9	+ 2	12 23	-20	16.1	19.3
Cape Town		38.0	75	7 42	+ 4	(13 37)	- 1	13.6	13.8
La Paz		49.5	305	i 9 3	- 1	i 16 11	- 2	24.5	29.3
Christchurch		80.0	193	21 14	?S	(21 14)	-69	42.3	54.6
Wellington		81.9	196	e 10 20	-130	i 22 44	- 1	40.9	42.3
Melbourne		87.0	173	13 26	+27	23 32	- 9	40.1	51.5
Adelaide		89.3	169	—	—	i 23 50	-16	e 44.3	58.3
Riverview		91.3	179	13 23	0	23 46	-41	37.3	53.2
Sydney		91.3	179	24 14	?S	(24 14)	-13	52.5	53.8
San Fernando		93.3	15	—	—	24 14	-34	49.9	58.3
Rio Tinto		94.4	15	27 20	?	—	—	—	45.3
Algiers		95.4	24	e 13 44	- 1	24 18	-52	40.3	52.3
Tacubaya		95.9	296	13 12?	-36	24 20	-55	42.6	53.8
Coimbra		96.6	12	e 15 50	?	24 25	-57	e 40.8	50.2
Helwan	E.	98.6	49	13 50	-13	—	—	—	62.1
	N.	98.6	49	15 20	+77	—	—	—	62.4
Tortosa		98.7	20	—	—	25 29	-14	40.0	82.7
Barcelona		99.7	22	e 15 48	+99	24 40	-73	39.1	57.0
Marseilles		102.1	23	e 17 35	?	—	—	49.3	54.6
Pompeii	E.	102.2	30	24 20	?S	(24 20)	-117	—	—
Athens		102.6	40	e 18 20	?PR ₁	24 41	-99	e 33.2	70.0
Rocca di Papa		102.6	29	e 18 50	?PR ₁	—	—	e 49.4	55.2
		102.6	29	e 17 59	?PR ₁	i 24 52	-88	—	70.4
Georgetown		103.0	322	e 18 44	?PR ₁	24 51	-93	e 33.1	—
Washington		103.0	322	e 18 25	?PR ₁	—	—	58.3	—
Florence		104.1	27	18 21	?PR ₁	—	—	—	53.7
Moncalieri		104.3	25	17 51	?PR ₁	27 11	+35	43.6	67.4
Colombo		105.6	100	18 20	?PR ₁	25 20	-88	52.3	56.3
Pola		105.8	29	e 25 14	?S	34 26	?SR ₁	48.5	64.2
Ithaca		105.9	324	—	—	e 25 20	-91	e 61.8	—
Besançon		106.0	23	18 49	?PR ₁	—	—	53.3	—
Paris		106.8	20	—	—	e 25 8	-111	51.3	60.3
Kodaikanal		106.9	94	25 26	?S	(25 26)	-94	55.9	62.6
Strasbourg		107.7	23	18 53	?PR ₁	28 27	+80	e 52.3	58.5
Belgrade		107.7	34	19 6	?PR ₁	28 23	+76	56.6	—
Batavia		108.1	131	19 21	?PR ₁	25 17	-114	59.8	—
Ottawa		108.3	327	19 5	?PR ₁	25 13	-120	e 32.3	—
Ann Arbor	E.	108.4	319	—	—	—	—	65.2	—
Kew		108.8	17	26 20	?S	(26 20)	-57	—	75.3
Oxford		108.9	16	—	—	26 54	-24	43.3	63.5
Uccle		109.1	20	e 19 14	?PR ₁	i 27 7	-13	45.3	58.7
Chicago		109.4	316	e 18 40	[+20]	—	—	53.3	—
Vienna		109.6	29	e 18 20	[- 1]	29 50	+146	—	59.3
Budapest		109.7	31	e 19 0	[+39]	e 29 30	+125	e 34.3	51.3
Bidston		110.3	15	—	—	25 30	-121	56.9	69.8
De Bilt	E.	110.5	21	—	—	e 25 27	-126	e 45.3	64.1
	N.	110.5	21	e 19 28	?PR ₁	e 29 4	+91	e 47.3	62.0
Bombay		111.2	87	52 54	?L	—	—	(52.9)	—
Eskdalemuir		112.1	13	i 25 27	?	i 29 12	+85	51.3	64.6
Edinburgh		112.6	13	27 32	?S	(27 32)	-19	57.3	60.5
Hamburg		112.9	22	e 19 38	?PR ₁	e 29 23	+90	e 48.3	58.3
Lemberg		113.3	34	—	—	—	—	e 59.1	63.3
Dyce		114.1	13	—	—	i 29 20	+77	59.3	63.3
Tiflis		114.5	50	—	—	e 29 20	+74	59.3	70.3
Lick	E.	122.0	290	—	—	—	—	e 30.4	—
Berkeley		122.7	290	i 20 45	?PR ₁	28 56	-14	40.7	66.7
Simla		123.2	81	e 26 44	?S	(26 44)	-149	e 52.7	56.7
Honolulu	E.	130.2	249	e 21 31	?PR ₁	—	—	61.3	65.7
	N.	130.2	249	—	—	—	—	60.3	66.3
Victoria		130.6	299	(20 10)	[+50]	11 48	?	20.2	82.1
Manila		132.8	137	e 19 20	[- 4]	—	—	—	—
Taihoku		142.4	131	—	—	—	—	e 62.3	—
Zi-ka-wei		147.6	125	e 20 17	[+25]	31 17	?	—	81.1

For Notes see next page.

NOTES TO SEPT. 13d. 2h. 36m. 40s.

Additional readings and notes: Cape Town gives also $S = +9m.11s.$ ($\uparrow PR_1$).
 La Paz $i = +16m.20s.$, $MN = +26.7m.$, $T_0 = 2h.36m.47s.$ Christchurch
 $PR_1 = +25m.20s.$, $S = +30m.8s.$ Wellington $e = +17m.8s.$ ($\uparrow PR_1$) and
 $+31m.32s.$ Melbourne $SR_1 = +29m.32s.$, $SR_2 = +33m.8s.$ Adelaide
 $i = +24m.20s.$, $e = +28m.44s.$, $i = +29m.56s.$, $e = +33m.20s.$, $i = +34m.32s.$,
 $e = +36m.56s.$, $+37m.38s.$, $+44m.20s.$ ($\uparrow L$), $+45m.26s.$, $+48m.20s.$,
 $+49m.8s.$, $+50m.2s.$, and $+54m.20s.$ Riverview $eP = +17m.41s.$,
 $eS = +24m.7s.$, $MN = +53.0m.$ San Fernando $MN = +53.3m.$ Algiers
 $i = +25m.5s.$ Tacubaya $MN = +58.8m.$ Athens $ePN = +18m.0s.$
 Rocca di Papa $eN = +17m.31s.$, $eLN = +24.7m.$ Georgetown $eN =$
 $+18m.52s.$ Apia ($\Delta = 104.0$) gives 2h. simply. Florence (another
 set) $P = +17m.20s.$, $M = +55.3m.$ Moncalieri $MN = +55.7m.$ Pola
 $ePR_1 = +28m.14s.$, $MN = +67.9m.$ Ithaca $L = +71.3m.$ Paris
 $MN = +63.3m.$ Belgrade $eL = +34.2m.$, $LN = +65.3m.$ Strasbourg
 $MN = +56.0m.$ Batavia $LN = +51.2m.$ Ottawa $SR_1E = +27m.35s.$,
 $iE = +28m.38s.$ Ann Arbor reading has been increased by 1h. Uccle
 $e = +25m.19s.$, $i = +28m.47s.$, $MN = +61.4m.$ Chicago $L = +63.3m.$
 Eskdalemuir $iN = +26m.34s.$, $SR_1 = +35m.27s.$ Edinburgh $S =$
 $+39m.38s.$ Hamburg $SR_1 = +35m.20s.$

Sept. 13d. 8h. 59m. 50s. Epicentre $38^\circ 0'N$, $20^\circ 5'E$.

$A = +.738$, $B = +.276$, $C = +.616$; $D = +.350$, $E = -.937$;
 $G = +.577$, $H = +.216$, $K = -.788$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^\circ$		m. s.	s.	m. s.	s.	m.	m.
Athens	2.6	91	i 0 42	+ 1	—	—	1.2	1.4
Pompeii	5.4	303	1 33	+10	2 34	+ 6	—	4.2
Mostar	5.7	341	1 5	-23	2 1	-35	—	3.3
Sarajevo	6.0	346	1 26	- 6	2 55	+11	—	3.4
Sinj	6.4	334	1 32	- 6	3 52	?L	(3.9)	4.9
Belgrade	6.8	0	e 1 31	-13	3 27	?L	(3.4)	5.2
Rocca di Papa	7.0	305	i 1 46	0	4 2	?L	(4.0)	4.4
Pola	8.4	326	e 2 7	0	e 3 36	-11	e 4.8	6.3
Florence	9.0	313	2 56	+40	(3 50)	-13	—	6.7
Budapest	9.5	355	e 2 2	-21	i 5 7	?L	e 9.2	—
Padova	9.8	322	2 34	+ 7	5 21	+58	5.8	6.3
Vienna	10.6	345	2 31	- 7	5 13	+28	i 6.0	7.0
Moncalieri	11.8	310	e 2 18	-38	5 16	+ 2	6.7	10.0
Lemberg	12.1	11	2 58	- 2	e 5 16	- 5	—	6.7
Helwan	12.1	129	3 10	+10	—	—	—	—
Marseilles	12.6	300	3 15	+ 8	—	—	6.8	8.5
Zurich	12.8	321	e 3 10	0	—	—	—	—
Algiers	13.9	271	3 25	0	e 6 53	+47	(e 6.9)	11.7
Besançon	14.0	316	3 33?	+ 7	5 46	-22	—	8.2
Strasbourg	14.0	323	3 17	- 9	e 5 44	-24	e 7.7	9.7
Barcelona	14.5	289	—	—	—	—	e 8.0	9.8
Tortosa	15.7	287	3 50	+ 2	6 58	+10	8.2	11.9
Paris	16.9	316	e 5 10	+66	—	—	—	—
Uccle	17.2	323	e 4 1	- 6	—	—	9.9	11.2
Hamburg	17.2	339	e 3 56	-11	—	—	e 9.2	11.2
De Bilt	17.7	328	—	—	e 7 47	+14	9.1	11.9
Tiflis	18.9	71	—	—	—	—	e 11.2	—
Granada	19.1	275	4 44	+14	8 22	+18	—	—
Bidston	22.4	321	—	—	—	—	i 13.0	—
Coimbra	22.5	285	5 5	- 6	i 9 6	- 9	13.2	15.0
Eskdalemuir	23.5	324	—	—	e 9 16	-19	10.2	—
Edinburgh	23.8	326	—	—	—	—	—	15.2
Dyce	24.3	330	—	—	—	—	14.9	—

Additional readings and notes: Zante ($\Delta = 1^\circ.5$) gives 8h.57m. Athens
 $iP = +48s.$, $MN = +1.6m.$, $T_0 = 8h.59m.54s.$ Pola $MN = +5.8m.$
 Florence gives its two readings as PS of different instruments. Moncalieri
 $MN = +9.0m.$ Helwan $PE = +4m.10s.$ Strasbourg $MZ = +8.4m.$
 $MN = +10.2m.$ De Bilt $MN = +11.5m.$

Sept. 13d. Readings also at 0h. (Batavia and Tiflis), 2h. (Manila, Apia, and near
 Batavia), 4h. (Georgetown and La Paz), 8h. (near Batavia), 10h. (Manila),
 11h. (Batavia and Helwan), 14h. (Helwan), 15h. (near Hokoto and
 Taihoku).

Sept. 14d. 3h. 27m. 35s. Epicentre $38^{\circ}0'N$. $20^{\circ}5'E$. (as on Sept. 13d.).

A = +.738, B = +.276, C = +.616; D = +.350, E = -.937;
G = +.577, H = +.216, K = -.788.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	2.6	91	e 0 42	+ 1	—	—	1.2	1.6
Pompeii	5.4	303	1 49	+26	3 9	?L	(3.2)	3.8
Mostar	5.7	341	i 1 34	+ 6	—	—	(i 3.3)	3.4
Sarajevo	6.0	346	e 1 32	0	—	—	3.3	3.7
Belgrade	6.8	0	e 1 34	-10	(3 39)	+34	i 3.6	4.7
Rocca di Papa	7.0	305	e 1 36	-10	i 3 57	+47	e 8.8	—
Pola	8.4	326	e 2 22	+15	e 3 34	-13	e 4.9	6.9
Florence	9.0	313	3 6	+50	(4 25)	+22	—	7.9
Budapest	9.5	355	e 2 25	+ 2	e 4 13	- 3	e 5.4	—
Padova	9.8	322	2 44	+17	—	—	(6.2)	7.6
Vienna	10.6	345	2 29	- 9	—	—	e 5.8	6.9
Moncalieri	11.8	310	(2 39)	-17	2 39	?P	6.0	7.6
Lemberg	12.1	11	—	—	e 5 1	-20	e 6.6	6.9
Helwan	12.1	129	7 25	?L	—	—	(7.4)	—
Algiers	13.9	271	3 23	- 2	—	—	—	11.4
Strasbourg	14.0	323	4 25	+59	—	—	—	9.6
Uccle	17.2	323	e 4 7	0	—	—	e 9.4	—
De Bilt	17.7	328	—	—	e 7 33	0	9.4	11.8
Kew	19.8	319	—	—	—	—	—	14.4
Eskdalemuir	23.5	324	—	—	e 9 29	- 6	12.9	—

Additional readings and notes: Zante ($\Delta = 1^{\circ}5'$) gives 3h. 30m. Athens
iPE = +48s., $T_0 = 3h.27m.34s.$ Rocca di Papa ePN = +1m.21s., iN =
1m.46s., iE = +1m.49s. Pola MN = +6.6m. Padova +8m.37s.
Moncalieri P = +58s., MN = +8.9m. Helwan PN = +8m.25s. Mar-
seilles ($\Delta = 12^{\circ}6'$) gives 3h. 30m. Strasbourg MN = +11.3m. De Bilt
MN = +11.6m.

Sept. 14d. Readings also at 10h. (La Paz and Helwan), 12h. (Tiflis), 13h. (Kew and Melbourne), 14h. (Tiflis and near Mizusawa), 16h. (Batavia (2) and near Mizusawa), 20h. (Tacubaya), 21h. (Rocca di Papa, Belgrade, and near Athens), 23h. (Manila and near Lick).

Sept. 15d. Readings at 0h. (Riverview, Melbourne, and near Tacubaya), 3h. (Adelaide), 10h. (Tiflis), 13h. (Batavia), 18h. (Simla), 19h. (Eskdalemuir, Edinburgh, Uccle, Helwan, Hamburg, and De Bilt).

Sept. 16d. Readings at 3h. (Taihoku), 5h. (near Algiers), 6h. (Apia and Batavia), 11h. (La Paz), 12h. (Batavia), 13h. (Helwan and Accra), 21h. (De Bilt, Helwan, La Paz, and Rocca di Papa).

Sept. 17d. 22h. 49m. 24s. Epicentre $36^{\circ}1'N$. $137^{\circ}3'E$. (as on 1921 May 22d.).

A = -.594, B = +.548, C = +.589.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	2.0	i 0 33	+ 2	0 54	- 1	1.0	1.0
Osaka	2.1	0 32	- 1	(0 54)	- 4	0.9	1.9
Kobe	2.2	0 34	0	(0 56)	- 4	0.9	0.9

Osaka gives also MN = +1.4m.

Sept. 17d. Readings also at 1h. (near Manila), 4h. (Helwan and Colombo), 7h. (Batavia), 8h. (Helwan), 13h. and 15h. (La Paz), 17h. (Riverview), 23h. (Batavia).

Sept. 18d. Readings at 3h. (Apia), 4h. (near Mizusawa), 6h. (Vera Cruz), 8h. and 14h. (Helwan), 15h. (near Batavia), 17h. (near Athens), 23h. (La Paz).

Sept. 19d. 4h. 6m. 45s. Epicentre $52^{\circ}5'N$. $170^{\circ}0'W$. (as on 1920 Aug. 26d.).

A = -·600, B = -·106, C = +·793; D = -·174, E = +·985;

G = -·781, H = -·138, K = -·609.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Sitka	E.	20·3	63	—	—	—	—	e 14·2	18·3
Victoria		29·5	79	—	—	(10 52)	-34	10·9	15·3
Honolulu	E.	32·4	158	—	—	e 12 6	-8	13·6	15·0
	N.	32·4	158	—	—	—	—	14·0	14·7
Berkeley		35·8	95	—	—	—	—	e 18·4	—
Lick	E.	36·6	95	—	—	—	—	e 18·8	—
Chicago		53·9	68	—	—	e 17 35	+27	27·0	—
Ann Arbor		55·7	65	—	—	—	—	33·4	—
Toronto		57·1	61	—	—	—	—	e 33·0	37·0
Ottawa	E.	58·7	57	—	—	—	—	e 28·2	—
Ithaca		59·5	62	—	—	—	—	34·2	—
Washington		61·7	62	—	—	—	—	e 30·6	—
Cheltenham	N.	61·9	62	—	—	—	—	e 31·1	39·8
Dyce	N.	69·8	9	—	—	—	—	43·8	—
Edinburgh		71·1	10	—	—	—	—	e 35·2	50·2
Eskdalemuir		71·6	10	—	—	e 20 55	+10	33·2	—
Stonyhurst		73·2	10	e 21 15	?S	(e 21 15)	+11	—	53·2
Bidston		73·5	10	—	—	21 40	+32	31·7	46·2
De Bilt	E.	75·4	4	—	—	21 30	0	e 32·2	49·8
	N.	75·4	4	—	—	—	—	e 35·2	48·4
Kew		75·7	9	—	—	—	—	—	52·2
Uccle		76·6	5	—	—	e 21 45	+1	e 31·2	54·8
Oxford		77·6	9	—	—	—	—	—	53·2
Paris		78·6	7	—	—	—	—	45·2	48·2
Strasbourg		79·0	2	—	—	—	—	45·2	—
Vienna		79·1	357	—	—	—	—	e 34·2	48·8
Moncalieri		82·5	2	e 4 45	?	22 51	-1	37·4	—
Pola		82·6	357	—	—	—	—	45·2	—
Marseilles		84·2	3	—	—	—	—	49·3	—
Rocca di Papa		85·8	358	e 12 51	-1	e 23 9	-19	e 50·8	63·4
Coimbra		86·0	13	36 57	?	49 35	?	e 62·2	—
Tortosa		86·4	8	—	—	—	—	e 48·2	55·6
Rio Tinto		88·6	13	57 45	?L	—	—	(57·8)	64·2
San Fernando E.		90·0	12	—	—	—	—	—	59·8
Colombo		96·5	290	59 15	?L	—	—	(59·2)	61·2

Additional readings and notes: Sitka gives also eE = +17m.52s. Berkeley
 eLE = +19·2m. Toronto eL = +43·6m., M = +47·2m. Ottawa
 e?E = +24m.57s. Washington L = +39·2m. Cheltenham eN =
 +37m.6s. and +39m.18s. Eskdalemuir eN = +25m.33s. Uccle
 MN = +52·2m. Kew reading has been increased by 1h. Paris MN =
 +55·2m. Rocca di Papa eL = +55·8m. Coimbra readings have been
 increased by 1h. San Fernando MN = +58·4m.

1921. Sept. 19d. 23h. 16m. 30s. Epicentre $19^{\circ}0'S$. $179^{\circ}0'E$.

A = -·945, B = +·017, C = -·326; D = +·017, E = +1·000;

G = +·325, H = -·006, K = -·946.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Apia		10·3	61	e 3 1	+27	—	—	5·0	11·6
Wellington		22·6	188	e 6 42	+90	i 10 0	+43	10·7	12·5
Riverview		28·8	234	6 15	-1	e 11 11	-2	e 13·7	14·6
Sydney		28·8	234	e 6 6	-10	e 11 12	-1	14·3	16·2
Adelaide		39·0	239	i 7 48	+2	i 13 36	-16	17·2	22·8
Honolulu	E.	46·2	31	8 35	-6	15 20	-11	18·9	22·3
	N.	46·2	31	—	—	—	—	18·6	22·1
Perth		57·6	244	9 58	+2	18 5	+11	32·2	—
Manila		66·3	297	10 58	+4	(19 42)	+1	19·7	—
Osaka		67·8	324	11 18	+15	—	—	—	24·3

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Batavia	71.1	271	i 11 19	- 5	—	—	—	—
Taihoku	71.1	308	e 12 30	+66	—	—	—	—
Zi-ka-wei	74.6	314	e 11 41	- 5	—	—	—	—
Berkeley	79.2	44	e 12 53	+39	e 21 39	-35	e 36.5	38.9
V. Victoria	79.2	44	e 12 17	+ 3	e 21 36	-38	e 36.4	—
Colombo	84.7	34	14 23	+97	22 45	-31	34.0	42.4
Chicago	100.9	273	—	—	—	—	58.5	—
La Paz	105.0	50	25 0	?S	(25 0)	-102	e 48.0	—
E. La Paz	105.1	115	19 22	?PR ₁	e 33 3	?SR ₁	50.5	52.4
N. Toronto	105.1	115	—	—	—	—	54.5	62.3
Georgetown	111.3	49	25 6?	?	34 30	?SR ₁	e 58.9	64.3
Washington	112.5	55	e 29 1	?S	35 52	?SR ₁	e 57.1	—
Ithaca	112.5	55	—	—	—	—	e 57.5	—
Ottawa	113.2	50	—	—	—	—	58.5	—
Fordham	114.0	47	e 29 15	?S	35 45	?SR ₁	54.5	—
Tiflis	115.1	53	—	—	—	—	58.0	66.0
Dyce	135.2	311	e 60 30	?	—	—	e 72.5	—
N. Edinburgh	141.8	1	—	—	—	—	77.3	81.5
Eskdalemuir	143.1	2	—	—	—	—	58.5	—
Hamburg	143.7	2	—	—	e 42 30	?SR ₁	59.5	99.3
Stonyhurst	144.4	348	e 19 59	[+12]	e 23 30	?PR ₁	e 59.5	82.1
Bidston	145.1	1	—	—	e 42 0	?SR ₁	—	90.5
De Bilt	145.6	1	—	—	—	—	70.7	91.1
Budapest	146.6	351	e 20 5	[+14]	e 41 57	?SR ₁	e 58.5	85.5
Oxford	147.2	334	19 44	[- 7]	—	—	e 68.5	139.5
Vienna	147.3	0	20 3	[+11]	—	—	60.2	82.2
Kew	147.6	339	i 19 53	[+ 1]	28 39	?	e 63.5	92.0
Uccle	147.6	0	86 30	?L	—	—	(86.5)	97.5
Belgrade	147.9	352	19 56	[+ 3]	i 42 10	?SR ₁	e 58.5	85.5
Helwan	148.6	330	e 19 56	[- 2]	23 20	?PR ₁	e 26.9	—
Strasbourg	148.7	296	22 30	?PR ₁	(27 30)	?	—	—
Paris	149.6	349	i 19 59	[+ 4]	e 33 48	?	e 60.5	77.3
Pola	150.1	356	i 20 8	[+12]	—	—	70.5	85.5
Padova	151.4	338	18 30	?	—	—	—	—
Moncalieri	151.5	341	20 27	[+29]	—	—	—	—
Florence	153.0	347	20 36	[+36]	33 24	?	61.5	87.9
Pompeii	153.2	340	—	—	47 30	?	—	84.5
Rocca di Papa	154.5	332	18 24	?	—	—	—	—
Marseilles	154.5	336	i 20 15	[+13]	—	—	e 69.2	92.6
Coimbra	155.1	349	e 20 38	[+36]	—	—	e 70.5	82.5
Tortosa	157.9	15	e 21 10	[+64]	—	—	59.7	—
Algiers	158.2	357	20 51	[+45]	—	—	e 68.5	97.4
San Fernando	161.9	350	20 58	[+49]	—	—	85.5	98.5
	162.0	14	—	—	—	—	—	96.5

Additional readings and notes: Apia gives also +5m.45s., MN = +8.2m.
 Wellington e = +1m.48s. Riverview eP = +5m.21s., PR₂ = +7m.7s. and
 +7m.21s., PS = +11m.19s., SR₁ = +13m.8s. and +13m.27s. Adelaide
 iPR₂ = +9m.18s., i = +13m.48s., iSR₂ = +16m.42s., e = +27m.30s. and
 +29m.18s. Perth PR₁ = +13m.12s., SR₁ = +23m.26s. and +26m.5s.
 Manila e = +10m.47s. Batavia i = +12m.17s. and +14m.29s., iN =
 +21m.14s., iE = +22m.0s. Berkeley iPV = +12m.24s. Chicago
 S = +33m.45s., L = +57.5m. Toronto L = +84.4m. Georgetown
 SN? = +35m.44s., eLN? = +45.7m. Ottawa eL?E = +44.5m. Dyce
 gives its readings as on 20d. Belgrade LN = +29.8m. Hamburg
 MN = +79.5m., MZ = +81.0m. Stonyhurst eP = +6m.30s. De Bilt
 MN = +86.8m. Epicentre 28° 0S. 176° 0W. Vienna iZ = +19m.59s.
 Strasbourg MN = +79.6m. Paris MN = +83.5m. Pola gives its
 readings as on 20d. Padova PR₁ = +23m.37s. Readings given as on
 20d. Rocca di Papa iPN = +20m.17s. Tortosa gives its readings as
 on 20d. San Fernando MN = +91.7m.

Sept. 19d. Readings also at 2h. (near Apia), 4h. (La Paz), 8h. (Riverview and
 Manila), 13h. (Tokyo), 15h. (Tiflis).

Sept. 20d. 18h. 51m. 30s. Epicentre $11^{\circ}08'$, $176^{\circ}00'$ W. (as on 1921 May 4d.).

A = -0.979, B = -0.068, C = -0.191; D = -0.070, E = +0.997;
G = -0.190, H = -0.013, K = -0.982.

Very tentative solution.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Honolulu	36.9	28	—	—	—	—	e 18.2	21.1
Riverview	37.7	228	—	—	(e 13 30)	- 4	e 13.5	15.6
Victoria	75.4	33	—	—	—	—	39.0	41.5
Toronto	102.4	47	—	—	—	—	e 59.4	—
Ottawa	105.0	44	—	—	—	—	e 57.5	—
Hamburg	137.2	355	—	—	—	—	e 78.5	—
De Bilt	138.9	359	—	—	—	—	e 76.5	—
Uccle	140.2	359	e 76 30	?L	—	—	(e 76.5)	—
Vienna	z. 141.1	347	19 30	[-11]	—	—	—	—
Paris	142.1	2	e 19 39	[- 4]	—	—	e 21.5	—
Strasbourg	142.2	356	e 19 36	[- 7]	—	—	—	—
Belgrade	143.4	339	e 19 37	[- 9]	i 21 16	?PR ₁	—	—
Helwan	148.3	311	87 30	?L	—	—	(87.5)	—
Rocca di Papa	148.3	348	e 20 0	[+ 7]	—	—	—	26.0

Additional readings and notes: Honolulu gives also MN = +21.2m. Riverview eS? = +12m.12s. Paris readings have been diminished by 1h. Helwan = +72m.30s.

Sept. 20d. 20h. 21m. 15s. Epicentre $1^{\circ}5'N$, $110^{\circ}0'E$. (as on 1918 Jan. 16d.).

A = -0.342, B = +0.939, C = +0.026; D = +0.940, E = +0.342;
G = -0.009, H = +0.025, K = -1.000.

But see note at end.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	8.3	202	i 1 29	-37	i 2 32	-73	—	—
Manila	17.0	39	e 4 23	+18	—	—	7.9	—
Zi-ka-wei	x. 31.6	20	e 6 44	+ 1	e 8 25	?PR ₁	—	12.0
Perth	33.8	170	8 55	?PR ₁	—	—	—	—
Simla	42.9	319	e 14 9	?S	(e 14 9)	-38	—	—
Mizusawa	E. 47.1	34	8 33	-15	15 19	-23	—	—
Riverview	52.4	136	e 16 42	?S	(e 16 42)	- 7	e 23.2	27.9
Rocca di Papa	94.5	313	i 18 33	?PR ₁	—	—	—	18.6

Additional readings: Batavia gives also i = +7m.25s. Mizusawa SN = +17m.27s. Riverview eS? = +20m.51s., MN = +25.2m.

The residuals are far from satisfactory. The main difficulty is to reconcile the good readings at Batavia and Mizusawa. The Batavia S-P gives $\Delta = 5^{\circ}3'$, $T_0 = 20h.21m.22s.$; the Mizusawa S-P gives $\Delta = 45^{\circ}7'$, $T_0 = 20h.21m.10s.$ The values of T_0 are thus fairly accordant and the mean has been adopted (within 1sec.). And yet the values of Δ only add up to $51^{\circ}0'$, while the distance from Batavia to Mizusawa is $55^{\circ}3'$. To make up the defect of $4^{\circ}3'$ we may perhaps assume an abnormal focal depth, which would have to be 0.050, with epicentre $5^{\circ}0'$ from Batavia, say at $1^{\circ}5'S$, $109^{\circ}3'E$. The result would be—

	Corr. for Focus	Δ	P.	O-C.	S.	O-C.
	°	°	m. s.	s.	m. s.	s.
Batavia	+0.3	5.2	i 1 29	+ 4	i 2 32	+ 1
Manila	-2.0	19.7	e 4 23	+10	—	—
Zi-ka-wei	-3.6	34.7	e 6 44	+ 5	e 8 25	?PR ₁
Simla	-4.4	44.8	—	—	(e 14 9)	- 4
Mizusawa	-4.8	50.0	8 33	- 1	15 19	+ 1
Riverview	-4.8	50.7	—	—	(e 16 42)	+75

These are fairly good, if we may presume an error of 1min. in Riverview. But Perth and Riverview are both discordant, and the right clue may be that there was a second shock following the first by about 2min.; see Zi-ka-wei and Mizusawa (SE and SN).

Sept. 20d. Readings also at 1h. (Ann Arbor, Toronto, and Victoria), 7h. (Zi-ka-wei), 8h. (Manila), 9h. (Riverview and Tiflis), 11h. (Batavia and near La Paz), 12h. (La Paz and Denver), 16h. (La Paz), 18h. (Rocca di Papa and Helwan), 19h. (Batavia), 20h. (near Athens), 22h. (Batavia (2)), 23h. (Batavia, Zi-ka-wei, and near Tokyo and Mizusawa).

Sept. 21d. 11h. 1m. 26s. Epicentre $15^{\circ} \cdot 5' \text{N}$. $39^{\circ} \cdot 0' \text{E}$. (as on 1921 Aug. 14d.).

A = +749, B = +606, C = +267; D = +629, E = -777;
G = +208, H = +168, K = -964.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Helwan	E.	16.0	335	3 58	+ 6	7 52	+57	—	8.7
	N.	16.0	335	3 22	-30	6 40	-15	—	7.9
Pompeii		33.0	326	7 34	+38	—	—	23.6	—
Belgrade		33.2	336	e 7 32	+34	(e 12 28)	+ 1	e 22.1	—
Rocca di Papa		34.7	325	e 7 10	- 1	i 12 48	- 3	e 20.4	25.1
Budapest	E.	36.0	337	7 30	+ 8	—	—	—	31.6
Pola		36.2	330	—	—	13 34	+21	—	—
Vienna		37.6	335	7 32	- 3	e 13 40	+ 8	—	25.6
Kodaikanal		37.8	93	13 52	?S	(13 52)	+17	21.1	22.4
Simla		38.2	59	e 12 34	?S	(12 34)	-67	—	23.3
Algiers		38.3	311	7 40	0	e 13 44	+ 2	19.6	21.6
Moncalieri		39.5	325	7 46	- 5	13 53	- 6	20.8	24.4
Marseilles		39.9	322	e 8 21	+27	—	—	21.6	—
Colombo		40.9	98	—	—	14 34	+14	—	22.6
Barcelona		41.0	319	—	—	—	—	e 17.8	25.3
Strasbourg		41.8	330	e 8 3	- 6	e 14 25	- 7	e 23.6	36.6
Tortosa		41.8	316	8 15	+ 6	14 34	+ 2	17.5	29.0
Hamburg		44.3	335	e 8 28	0	e 15 3	- 3	e 25.6	28.6
Paris		44.7	325	8 34	+ 3	15 13	+ 2	22.6	24.6
Uccle		44.9	330	e 8 34	+2	15 13	- 1	e 18.6	—
San Fernando		45.2	307	8 52	+18	—	—	—	25.1
De Bilt		45.4	332	—	—	15 20	0	e 21.6	32.5
Rio Tinto		45.8	309	21 34	?L	—	—	(21.6)	36.6
Kew		47.6	328	—	—	—	—	—	31.6
Coimbra	E.	47.9	311	—	—	—	—	20.7	28.8
	N.	47.9	311	—	—	(16 4)	+11	16.1	34.6
Oxford		48.3	327	—	—	i 16 1	+ 3	i 20.0	—
Stonyhurst		50.1	329	—	—	—	—	—	32.6
Bidston		50.1	329	—	—	—	—	25.2	39.2
Eskdalemuir		51.2	330	—	—	e 16 41	+ 7	22.6	31.7
Edinburgh		51.5	330	—	—	—	—	28.6	31.6
Cape Town		53.1	201	23 13	?L	26 32	?L	27.5	28.6
Batavia		70.6	103	—	—	i 21 3	+30	—	—
Zi-ka-wei		75.7	61	e 11 57	+ 4	—	—	—	47.7
Ottawa	E.	95.4	320	—	—	e 24 8	-62	e 48.6	—
Toronto		98.4	320	—	—	—	—	71.9	77.8
Chicago		104.5	321	—	—	—	—	59.6	—
La Paz		110.4	259	e 17 10	?	—	—	54.6	60.4
Melbourne		111.9	125	—	—	—	—	56.6	62.6
Victoria		114.2	348	—	—	—	—	68.0	74.4
Riverview		116.8	121	e 52 16	?L	—	—	e 60.0	61.7

Additional readings: Belgrade gives S as SR₁ and LN = +23.8m. Moncalieri MN = +23.9m. Strasbourg eS = +14m.14s. San Fernando MN = +27.3m. De Bilt SR₁ = +18m.48s., MN = +29.5m. Oxford gives S = +14m.34s. Toronto eL = +77.4m. Melbourne readings have been increased by 1h. Riverview MN = +63.0m.

Sept. 21d. Readings also at 1h. (Batavia and Sapporo), 4h. (near Belgrade), 6h. (La Paz, De Bilt, and near Strasbourg and Zurich), 10h. (Tiflis), 12h. and 15h. (La Paz).

Sept. 22d. 6h. 32m. 57s. Epicentre $4^{\circ}0'S$. $101^{\circ}0'E$. (as on 1919 Oct. 12d.).

A = -190 , B = $+979$, C = -070 ; D = $+982$, E = $+191$;
G = $+013$, H = -069 , K = -998 .

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	6.2	111	i 1 33	- 2	2 24	-25	i 3.4	—
Colombo	23.7	297	9 3	?S	(9 3)	-35	—	12.6
Kodaikanal	27.4	301	10 51	?S	(10 51)	+ 3	16.6	18.0
Perth	31.2	154	—	—	11 3	-51	—	—
Taihoku	35.1	35	—	—	—	—	e 21.0	—
Zi-ka-wei	40.2	28	e 7 56	- 1	14 10	0	—	—
Melbourne	52.4	138	—	—	e 25 33	?L	32.4	34.6
Riverview	55.3	130	—	—	e 17 27	+ 2	28.6	30.9
De Bilt	E. 96.7	322	—	—	—	—	e 57.0	62.1
N.	96.7	322	—	—	—	—	e 56.0	65.3

Additional readings: Melbourne gives also e = $+29m.15s$. Riverview
eS? = $+21m.45s$. (?SR₁), MN = $+29.0m$.

Sept. 22d. 9h. 14m. 0s. Epicentre $6^{\circ}5'N$. $126^{\circ}0'E$. (as on 1920 Nov. 3d.).

A = -584 , B = $+804$, C = $+113$; D = $+809$, E = $+588$;
G = -066 , H = $+092$, K = -994 .

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	9.5	330	—	—	e 3 32	-44	—	—
Batavia	22.9	237	e 5 16	0	e 9 13	-10	—	—
Zi-ka-wei	25.0	351	e 5 35	- 3	e 10 7	+ 4	—	—
De Bilt	102.9	327	—	—	—	—	e 55.0	—
Uccle	104.0	326	—	—	—	—	—	56.0
La Paz	162.9	127	20 2 [- 8]	—	—	—	—	—

Ten minutes have been added to the La Paz reading.

Sept. 22d. Readings also at 2h. (Apia), 6h. (Manila), 13h. (Azores), 14h. (La Paz), 17h. (near Batavia).

Sept. 23d. Readings at 2h. (Toronto, Melbourne, Strasbourg, Victoria, Honolulu, and Vienna), 3h. (De Bilt and Uccle), 4h. (Helwan), 8h. (La Paz), 13h. (Rocca di Papa), 14h. (Taihoku), 16h. (Helwan), 19h. (Manila), 23h. (La Paz).

Sept. 24d. Readings at 1h. (Pompeii), 2h. (Algiers and Taihoku), 3h. (Zi-ka-wei), 5h. (La Paz), 6h. (Taihoku and Helwan), 7h. (Helwan), 15h. (La Paz), 19h. (Helwan).

Sept. 25d. Readings at 5h. (Manila), 10h. (Wellington), 15h. (Manila), 22h. (La Paz), 23h. (near Mizusawa).

Sept. 26d. 9h. 25m. 55s. Epicentre $39^{\circ}3'N$. $33^{\circ}2'E$.

A = $+648$, B = $+424$, C = $+633$; D = $+548$, E = -837 ;
G = $+530$, H = $+347$, K = -774 .

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	7.5	263	1 47	- 7	3 23	- 1	3.6	4.3
Helwan	9.5	190	4 5	?S	(4 5)	-11	—	—
Belgrade	11.0	304	e 2 48	+ 4	(i 5 23)	+29	i 6.2	7.2
Lemberg	12.4	332	—	—	e 5 11	-18	—	8.1
Budapest	13.1	313	e 3 27	+13	e 7 9	?L	e 9.1	—
Pompeii	E. 14.4	282	3 19	-13	8 5	?L	(8.1)	10.1
Vienna	15.0	312	i 3 38	- 1	i 6 49	+17	e 8.8	9.3

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Pola	15.3	297	e 3 53	+10	—	—	e 8.6	9.2
Rocca di Papa	15.8	286	e 3 47	-2	i 6 50	0	e 8.0	9.5
Padova	16.8	298	3 55	-7	6 35	-38	—	—
Zurich	19.6	302	e 4 35	-1	e 8 17	+2	—	—
Moncalieri	19.6	295	i 4 43	+7	8 21	+6	10.8	12.6
Strasbourg	20.4	305	4 48	+2	i 8 32	0	e 11.1	12.8
Besançon	21.2	301	4 52	-3	9 0	+12	11.1	—
Marseilles	21.2	290	5 1	+6	8 55	+7	11.1	12.2
Hamburg	21.3	320	e 5 0	+3	e 8 53	+3	e 12.5	13.4
De Bilt	23.2	313	5 18	-1	9 28	-1	e 11.1	15.6
Uccle	23.2	309	e 5 14	-5	e 9 24	-5	12.3	13.5
Algiers	23.8	274	5 19	-7	e 9 34	-6	e 11.6	17.1
Paris	23.8	304	e 5 24	-2	i 9 36	-4	12.1	15.1
Tortosa	24.9	284	5 32	-5	9 35	-26	10.7	14.7
Kew	26.2	309	—	—	—	—	—	11.1
Eskdalemuir	29.0	316	e 6 15	-3	11 4	-13	13.1	20.0
Dyce N.	29.1	320	—	—	(11 5)	-14	11.1	20.9
Edinburgh	29.1	317	—	—	11 11	-8	—	20.2
Rio Tinto	30.9	280	15 5	?L	—	—	(15.1)	18.1
San Fernando	31.0	277	0 51	?	—	—	13.9	17.1
Colombo	52.9	115	34 5	?L	—	—	(34.1)	36.1

Additional readings and notes: Athens gives $iE = +3m.35s.$, $MN = +3.9m.$, $T_0 = 9h.25m.45s.$ Belgrade gives S as SR_1 and $MN = +6.3m.$ Budapest readings are given as at 10h. Vienna $iSN = +6m.54s.$, $MN = +10.1m.$ Pola $MN = +9.6m.$ Readings given as at 8h. Padova $+12m.15s.$, $+14m.15s.$, and $+16m.15s.$ Moncalieri $MN = +12.8m.$ Strasbourg $iP = +4m.50s.$, $iS = +8m.34s.$, $MN = +11.8m.$, epicentre $39^\circ 0'N.$ $32^\circ 5'E.$ Hamburg $MN = +13.2m.$ De Bilt $MN = +13.6m.$ Uccle $P = +5m.18s.$, $iS = +9m.29s.$ Epicentre $37^\circ 0'N.$ $30^\circ 5'E.$ Paris $eSN = +9m.31s.$, $MN = +13.1m.$ Eskdalemuir $MN = +17.3m.$ San Fernando $MN = +18.7m.$

Sept. 26d. 21h. 14m. 42s. Epicentre $29^\circ 0'N.$ $137^\circ 0'E.$ (roughly).

$$A = -.640, B = +.596, C = +.485; \quad D = +.682, E = +.731; \\ G = -.355, H = +.331, K = -.875.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Osaka	5.8	348	1 32	+2	(2 44)	+5	2.7	3.5
Kobe	5.9	345	1 35	+4	(2 47)	+6	2.8	3.6
Tokyo	7.0	18	i 1 32	-14	(2 40)	-30	2.7	2.8
Nagasaki	7.2	303	2 6	+17	—	—	3.8	4.0
Mizusawa E.	10.7	17	2 13	-27	3 51	-57	—	—
N.	10.7	17	2 15	-25	3 53	-55	—	—
Zi-ka-wei Z.	13.7	283	e 3 18	-4	6 0	-1	—	8.1
Manila	20.7	229	e 5 18	+29	—	—	—	—

Tokyo gives also $S = +2m.10s.$

Sept. 26d. Readings also at 2h. (Riverview), 3h. (Melbourne), 14h. (Batavia), 18h. (Cape Town), 20h. (Riverview, Sydney, and Manila), 21h. (De Bilt and Victoria).

Sept. 27d. 16h. 20m. 54s. Epicentre $39^\circ 5'N.$ $145^\circ 0'E.$

$$A = -.632, B = +.443, C = +.636; \quad D = +.574, E = +.819; \\ G = -.521, H = +.365, K = -.772.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa N.	3.0	263	0 38	-9	0 57	-26	—	—
Tokyo	5.6	229	i 1 10	-17	2 1	-33	2.6	2.8
Ootomari	7.4	348	2 6	+14	(3 24)	+3	3.4	—
Osaka	9.0	241	2 16	0	—	—	2.5	6.3
Kobe	9.2	242	2 26	+7	3 54	-14	4.4	4.9
Nagasaki	13.9	246	e 3 46	+21	(6 5)	-1	6.1	10.1
Zi-ka-wei	20.8	254	e 4 39	-12	e 8 29	-11	—	12.2
Manila	32.6	228	e 7 40	+47	—	—	—	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tiflis	71.3	310	e 9 6	-139	—	—	—	—
Lemberg	76.6	325	—	—	e 20 6	-98	—	46.8
Hamburg	79.2	335	e 12 14	0	e 22 14	0	42.5	46.1
Dyce	79.4	344	—	—	—	—	46.1	—
Budapest	80.6	327	—	—	—	—	e 45.1	51.1
Edinburgh	80.9	343	—	—	—	—	45.1	53.1
Vienna	81.1	329	12 20	-6	—	—	e 45.1	55.6
Eskdalemuir	81.4	343	e 12 31	+4	22 47	+8	43.1	46.9
De Bilt	82.0	336	—	—	e 22 46	0	e 43.1	47.9
Stonyhurst	82.5	341	47 6	?L	—	—	(47.1)	55.6
Uccle	83.3	336	—	—	e 23 0	0	e 44.1	48.6
Strasbourg	84.2	333	e 12 40	-3	—	—	—	48.2
Kew	84.2	340	—	—	—	—	—	56.1
Oxford	84.2	340	—	—	—	—	—	50.2
Pola	84.9	328	—	—	—	—	48.1	—
Paris	85.7	336	e 12 6	-46	—	—	48.1	49.1
Moncalieri	87.2	331	e 13 8	+8	24 17	+34	47.4	50.4
Helwan	87.2	308	23 6	?S	(23 6)	-37	—	—
Rocca di Papa	88.0	326	14 12	+67	—	—	e 48.3	58.6
Marseilles	89.6	332	—	—	—	—	48.1	—
La Paz	143.2	60	e 22 6	?PR ₁	—	—	—	—

Additional readings: Mizusawa gives also PE = +39s. Osaka MN = +7.0m.
 Kobe MN = +4.7m. Zi-ka-wei MN = +12.0m. Hamburg MN =
 +45.1m. De Bilt MN = +52.8m. Strasbourg MN = +53.2m.
 Paris MN = +62.1m. Moncalieri MN = +51.6m. Helwan PN =
 +21m.6s. Rocca di Papa L = +50.3m.

Sept. 27d. Readings also at 1h. (Colombo), 7h. (Helwan, Colombo, and Manila),
 9h. (Tortosa), 10h. (La Paz), 11h. (Manila), 14h. (Batavia), 16h. (Tokyo
 (2) and Mizusawa (4)), 18h. (La Paz), 19h. (Helwan).

Sept. 28d. 17h. 8m. 50s. Epicentre 11° 0'N. 127° 0'E. (as on 1920 June 10d.).

A = -591, B = +784, C = +191; D = +799, E = +602;
 G = -115, H = +152, K = -982.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	6.9	303	e 1 42	-3	(2 57)	-10	3.0	3.5
Zi-ka-wei	20.8	347	e 5 5	+14	e 8 44	+4	—	—
Helwan	89.4	301	63 10	?L	—	—	(63.2)	—
De Bilt	99.6	329	—	—	—	—	e 51.2	55.0
Uccle	100.8	327	—	—	—	—	e 50.2	—
Eskdalemuir	101.8	335	—	—	—	—	48.2	—

Additional readings: Helwan gives also PN = +61m.10s. De Bilt MN =
 +53.7m.

Sept. 28d. Readings also at 1h. (Colombo), 3h. (Manila), 6h. (near Mizusawa),
 23h. (Taihoku).

Sept. 29d. 13h. 9m. 20s. Epicentre 49° 5'N. 152° 5'E.

A = -576, B = +300, C = +760; D = +462, E = +887;
 G = -674, H = +351, K = -649.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	7.1	249	1 56	+8	(3 32)	+19	3.5	—
Mizusawa	13.1	222	3 16	+2	5 38	-8	—	—
	13.1	222	3 14	0	5 40	-6	—	—
Tokyo	16.6	219	e 3 55	-5	—	—	e 5.8	7.8
Osaka	19.4	226	4 34	0	—	—	—	13.3
Zi-ka-wei	29.6	243	e 6 13	-11	e 11 10	-17	—	—
Manila	43.3	228	e 7 40	-40	—	—	—	—
Honolulu	47.9	107	—	—	e 19 23	?SR ₁	21.4	23.6
	47.9	107	—	—	e 19 28	?SR ₁	21.2	23.8

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Victoria	52.3	58	—	—	19 27	?	26.3	32.2
Simla	57.7	281	e 32 34	?L	—	—	(e 32.6)	—
Batavia	68.3	230	e 10 59	- 7	i 20 3	- 3	—	—
Edinburgh	72.7	347	—	—	—	—	41.7	45.7
Eskdalemuir	73.2	347	—	—	e 21 8	+ 4	36.7	—
Stonyhurst	74.5	346	21 10	?S	(21 10)	-10	—	52.7
De Bilt	74.7	340	—	—	21 26	+ 4	e 37.7	45.5
Bidston	75.0	346	11 46	- 3	i 21 30	+ 4	—	51.2
Vienna	75.2	331	i 11 49	- 1	—	—	—	45.7
Uccle	76.0	340	e 11 53	- 2	e 20 39	-58	e 38.7	44.7
Oxford	76.4	345	—	—	—	—	—	50.2
Belgrade	76.9	328	e 10 45	-75	e 20 48	-60	e 31.6	35.3
Strasbourg	77.4	338	11 59	- 4	22 21	+28	e 42.7	—
Paris	78.4	341	e 12 4	- 5	e 22 6	+ 1	—	45.7
Pola	79.0	331	—	—	—	—	42.7	—
Besançon	79.1	338	—	—	22 1?	-12	42.7	—
Moncalieri	80.7	336	e 12 51	+28	22 45	+14	42.8	53.7
Rocca di Papa	82.2	330	—	—	i 22 49	+ 1	e 48.2	55.9
Marseilles	82.9	337	e 12 48	+13	e 22 57	+ 1	e 44.7	—
Helwan	85.0	312	23 40	?S	(23 40)	+21	—	—
Tortosa	86.4	340	—	—	—	—	e 46.7	51.8
Coimbra	88.8	347	—	—	e 24 40	+39	e 46.7	—
La Paz	133.5	58	i 18 58	[-28]	—	—	63.6	63.9

Additional readings: Osaka gives also MN = +12.6m. De Bilt eSR₁ = +26m.38s., MN = +43.6m. Uccle SR₁ = +27m.10s. Strasbourg S? = +22m.26s. Paris ePE = +12m.33s. Moncalieri MN = +54.5m. Helwan PN = +20m.40s. La Paz gives iP = +63m.6s., which, with L and M, form a separate shock. It would seem that these readings are connected with the long waves of the above shock, and they are entered for what they are worth.

Sept. 29d. Readings also at 6h. (Manila), 8h. (near Athens and near Manila), 11h. (near Tokyo), 13h. (Manila), 14h. (Tucson), 20h. (near Osaka and Kobe).

Sept. 30d. Readings at 0h. (Helwan), 4h. (La Paz), 7h. (Helwan and near La Paz), 10h. (near Mizusawa, Zi-ka-wei, and near Manila), 14h. (Manila), 17h. (near Sarajevo), 18h. (La Paz), 22h. (near Oaxaca and Tacubaya).

The International Seismological Summary for 1921 October, November, December.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number of the Summary deals with 65 epicentres, 18 of which are new and 47 repetitions from old epicentres. Corresponding figures are :

	New	Old	Ratio
1913-1920 March	597	550	1.09
1920 Apr.—Dec.	85	139	0.61
1921 Jan.—Mar.	31	30	1.03
Apr.—June	29	36	0.81
July—Sept.	26	36	0.72
Oct.—Dec.	18	47	0.38
All	104	149	0.70

The ratio of New Epicentres to Old is not perhaps decreasing so rapidly as might be expected.

The work of collation is still subject to delays from the tardy receipt of information.

Those observers who have not already communicated their readings for 1922 and 1923 are urgently requested to send them without delay to the University Observatory, Oxford.

There are three cases of suggested abnormal focal depth, viz.:

Oct. 10d. 2h.	5°·0S.	135°·0E.	Depth 0·060
Nov. 15d. 20h.	36°·5N.	70°·5E.	Depth 0·030
Dec. 18d. 15h.	2°·5S.	71°·0W.	Depth 0·080

Attention may be called to the last case, where the possibilities are fully explored in an appended note. For a reason which is not yet ready for publication, it was actually desired to move the Epicentre to the Pacific Ocean, but this was found impossible, and incidentally other changes were tried and found unsatisfactory. The solution with the very deep focus 0·080 is, on the other hand, satisfactory in most ways, though there is a curious divergence of 20 sec. between stations within 45° of the Epicentre and those without in the specification of T_0 .

In Fascicule No. 2 of Série A of the International Section of Seismology (Travaux Scient.) which has recently been circulated, Professor Rothé has given a discussion of the Strasbourg readings for 1920 in the light of the residuals found in the corresponding numbers of the Summary. These remarks are under consideration, but have not yet been fully dealt with, and comments must be deferred. Meanwhile, the attention of other observatories is invited to the possibility of advancing our imperfect knowledge by such revision of their readings, which has already been urged in individual cases.

A paper has been sent to the R.A.S. for publication in the Geophysical Supplement, discussing the 4-year period in frequency of earthquakes. It appears that the circuit of longitude may be divided into twelve lunes, in which the frequency is similar. These lunes are only approximately of 30° each, and the exact arrangement is shown in the "Cage" printed on p. 135 for convenience of reference. The numbers of earthquakes in the four years concluding with the present in the 12 vertical columns of the "Cage" of lunes are as follows :—

	A	B	C	D	E	F	G	H	I	J	K	L
1918	28	12	7	11	21	30	31	33	39	37	52	49
1919	23	29	16	11	20	36	23	22	30	34	34	32
1920	15	11	11	24	51	32	21	28	24	26	32	26
1921	26	16	16	11	20	25	17	16	33	17	30	31
Sum.	92	68	50	57	112	123	92	99	126	114	148	138

It will be seen that the "Cage" itself represents a marked inequality of distribution, lune K having nearly 3 times the number of lune C during the 4 years. But the 4-year periodicity is superposed on this longitude inequality. In lune E the maximum is in 1920 ; in lune K it is in 1918. A fuller discussion will be given later.

H. H. TURNER.

University Observatory, Oxford.
1925, October 1.

CAGE OF LONGITUDES WHERE THE 4-YEAR PERIOD IS THE SAME IN PHASE.

[illegible]

West Longitudes are in italics.

1921 OCTOBER, NOVEMBER, & DECEMBER.

Oct. 1d. 21h. 2m. 10s. Epicentre $1^{\circ}8'N$. $86^{\circ}0'W$. (as on 1914 Nov. 18d.).

$A = +.070$, $B = -.997$, $C = +.031$; $D = -.998$, $E = -.070$;
 $G = +.002$, $H = -.031$, $K = -1.000$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tacubaya	E.	21.9	325	5 25	+21	10 18	+75	12.0	—
La Paz		25.4	137	15 42	0	10 10	-1	12.8	16.6
Washington		38.0	13	—	—	16 50	?	e 21.8	—
Toronto		42.3	7	—	—	—	—	20.5	—
Ottawa		44.5	10	—	—	—	—	22.8	—
Eskdalemuir		84.4	35	—	—	e 23 19	+7	39.2	—
Edinburgh		84.5	34	—	—	28 50	?SR ₁	—	—
Stonyhurst		84.7	36	e 23 50	?S	(e 23 50)	+34	—	—
Oxford		85.3	39	—	—	—	—	—	43.1
Uccle		88.8	40	—	—	e 23 50	-11	e 41.8	44.8
De Bilt	E.	89.0	39	—	—	e 23 50	-13	e 41.8	45.5
	N.	89.0	39	—	—	—	—	e 40.8	47.4

Additional readings: Tacubaya gives also LN = +11.9m. La Paz MN = +15.9m., T₀ = 21h.2m.15s. Toronto L = +23.3m. and +27.0m.
 Ottawa eLE = +17.8m. Helwan ($\Delta = 112^{\circ}5$ Az. = 56°) gives 21h.0m.

Oct. 1d. Readings also at 1h. (Batavia), 2h. (La Paz), 4h. (near Batavia), 10h. (Manila, La Paz (2), and Batavia), 11h. (Helwan), 16h. (Paris, De Bilt, Uccle, and Helwan), 17h. (Toronto), 18h. (Batavia), 22h. (near Tacubaya)

Oct. 2d. 14h. 58m. 0s. Epicentre $35^{\circ}0'N$. $139^{\circ}5'E$. (as on 1920 May 22d.).

$A = -.623$, $B = +.532$, $C = +.574$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	0.7	16	10 19	+8	—	—	0.5	0.5
Osaka	3.4	266	1 5	-12	—	—	2.1	2.9
Mizusawa	4.3	17	1 5	-2	1 44	-14	—	—

No additional readings.

Oct. 2d. 18h. 25m. 8s. Epicentre $55^{\circ}0'N$. $38^{\circ}0'E$.

$A = +.452$, $B = +.353$, $C = +.819$; $D = +.616$, $E = -.788$;
 $G = +.646$, $H = +.504$, $K = -.574$.

Very rough.

	Δ	Az.	P.	O-C.	S.	O-C.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.
Vienna	14.9	252	14 43	+65	—	—	5.9
Strasbourg	19.6	264	e 4 43	+7	—	—	—
Uccle	20.5	271	e 4 43	-4	—	—	—
Rocca di Papa	21.1	242	14 54	0	e 8 46	0	—

Helwan ($\Delta = 25^{\circ}6$) gives PN = 18h.25m.

Oct. 2d. Readings also at 3h. (near Tacubaya), 14h. (La Paz), 18h. (Batavia).

Oct. 3d. Readings at 0h. (near Mizusawa), 3h. (Rocca di Papa), 5h. (La Paz), 6h. (San Fernando), 7h. (near Colima), 10h. (Christchurch and Wellington), 12h. (Rocca di Papa and Belgrade), 17h. (near Sarajevo), 22h. (La Paz and near Mizusawa), 23h. (near Batavia).

Oct. 4d. 5h. 23m. 0s. Epicentre $34^{\circ}5'N$, $25^{\circ}0'E$. (as on 1920 Nov. 21d.).

A = +.747, B = +.348, C = +.566; D = +.423, E = -.906;
G = +.513, H = +.239, K = -.824.

Very rough determination.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens		3.6	344	e 0 55	- 1	1 46	+ 7	1.9	2.2
Helwan		7.1	129	2 0	+12	—	—	(6.0)	—
Belgrade	N.	10.9	343	e 1 23	-80	—	—	7.4	8.4
Rocca di Papa	E.	12.1	310	e 3 0	0	5 6	-15	e 8.0	—
	N.	12.1	310	e 3 12	+12	5 30	+ 9	—	—
Pola		13.4	324	—	—	—	—	6.0	—
Vienna		15.2	337	—	—	—	—	e 8.8	11.8
Moncalieri		16.9	314	e 5 47	+103	—	—	9.9	—
Marseilles		17.6	306	4 0	-12	—	—	—	—
Strasbourg		19.0	323	e 4 35	+ 6	—	—	—	—
Hamburg		21.8	336	—	—	e 8 0	-61	—	15.0
Uccle		22.1	324	—	—	—	—	e 11.7	—
De Bilt		22.6	327	—	—	—	—	e 12.5	15.3
Oxford		25.6	321	—	—	e 10 20	+ 6	—	—

Additional readings and notes: Athens gives also MN = +2.7m. Belgrade
PR₁ = +5m.1s., SR₁ = +5m.19s., SR₂ = +6m.2s. Rocca di Papa SE and
N are increased by 2m. De Bilt MN = +16.0m.

Oct. 4d. Readings also at 5h. (near Tokyo), 8h. (Batavia), 14h. (Rio Tinto),
19h. (near La Paz), 20h. (Lemberg and Helwan), 21h. (Zi-ka-wei, Taihoku
(2), and Manila), 22h. (De Bilt).

Oct. 5d. 1h. 42m. 20s. Epicentre $50^{\circ}0'N$, $175^{\circ}0'W$. (as on 1919 Jan. 27d.).

A = -.640, B = -.056, C = +.766; D = -.087, E = +.996;
G = -.763, H = -.067, K = -.643.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Honolulu		31.6	147	—	—	—	—	e 15.4	—
Victoria		33.1	71	—	—	(12 38)	+12	12.6	19.5
Zi-ka-wei	Z.	50.1	273	—	—	e 18 35	+135	—	40.8
Chicago		57.8	61	—	—	e 17 45	-11	e 31.3	—
Eskdalemuir	N.	74.4	4	e 11 38	- 7	20 55	-24	36.7	—
De Bilt		77.9	359	—	—	—	—	e 37.7	51.7
Uccle		79.2	0	—	—	e 22 40	+26	e 37.7	—
Batavia		87.2	258	i 13 1	+ 1	—	—	—	17.7
Riverview		89.0	208	—	—	e 30 46	?SR ₁	e 40.2	41.6
Helwan		96.8	337	43 40	?L	(31 40)	?SR ₁	(43.7)	—

Additional readings: De Bilt gives also MN = +54.7m. Batavia iN =
+13m.57s., iE = +14m.32s., and +15m.32s.

Oct. 5d. 4h. 16m. 32s. Epicentre $40^{\circ}3'N$, $139^{\circ}5'E$. (as on 1920 Feb. 7d.).

A = -.580, B = +.495, C = +.647; D = +.649, E = +.760;
G = -.492, H = +.420, K = -.763.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	1.7	133	0 33	+ 7	0 58	+10	—	—
	N.	1.7	133	0 34	+ 8	0 59	+11	—	—
Tokyo		4.7	178	i 1 7	- 6	(1 58)	-11	2.0	2.6
Osaka		6.5	212	1 40	+ 1	—	—	3.2	3.6
Zi-ka-wei	Z.	17.2	244	—	—	e 6 57	-25	—	—
De Bilt		79.6	333	—	—	—	—	e 45.5	—
Uccle		80.8	333	—	—	—	—	—	44.5

Additional readings: Tokyo gives also S = +1m.21s. Osaka MN = +4.4m.
Kobe (Δ -6.6) ePSEN = 4h.12m.2s.

Oct. 5d. Readings also at 0h. (Batavia), 12h. (near Belgrade), 17h. (La Paz and near Batavia), 18h. (near Batavia), 20h. (Riverview).

Oct. 6d. 15h. 59m. 36s. Epicentre $43^{\circ}0'N$, $170^{\circ}0'E$.

$$A = -.720, B = +.127, C = +.682; \quad D = +.174, E = +.985; \\ G = -.672, H = +.118, K = -.731.$$

If we accept the Mizusawa S as correct and assume that the P is 1 minute late, an epicentre at $41^{\circ}5'N$, $162^{\circ}5'E$, would satisfy the European observations equally well, and Batavia rather better, but not Manila or La Paz.

	Δ	Az.	P.	O-C.	S.	O-C.	L.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.
Mizusawa	22.0	270	5 1	- 4	7 9	?	—
Manila	50.5	251	—	—	e 17 7	+42	—
Batavia	75.2	247	—	—	i 20 49	-39	—
Eskdalemuir	81.5	357	i 12 35	+ 7	e 20 44	-117	—
Hamburg	81.9	349	i 12 30	0	e 22 46	+ 1	39.4
De Bilt	84.0	351	12 48	+ 6	e 23 56	+48	e 32.4
Uccle	85.4	351	e 12 51	+ 1	e 23 24	+ 1	—
Vienna	85.8	344	i 12 48	- 4	—	—	—
Strasbourg	87.1	349	e 12 59	- 1	—	—	—
Paris	87.5	352	e 13 5	+ 3	e 24 30	+43	e 50.4
Besançon	88.7	350	13 12	+ 3	—	—	—
Padova	89.4	346	13 16	+ 4	—	—	—
Marseilles	92.6	350	e 13 38	+ 8	—	—	—
Rocca di Papa	92.8	344	13 24	- 7	(23 12)	-92	—
Helwan	97.9	325	35 24	?SR ₁	(27 24)	+109	—
La Paz	124.3	82	20 24	?PR ₁	—	—	—

Additional readings and notes: Mizusawa gives also PN = +5m.6s., Eskdalemuir eN = +12m.36s. De Bilt e = +22m.0s. Padova PR₁E = +14m.14s. and PR₁N = +14m.38s. Rocca di Papa SN = +16m.37s., SE = +16m.42s. The S in the table is given as PR₁.

Oct. 6d. Readings also at 7h. (Helwan), 14h. (La Paz), 16h. (near Belgrade), 22h. (Hamburg, Vienna, De Bilt, Taihoku, Helwan, Rocca di Papa, Eskdalemuir, and Uccle).

Oct. 7d. Readings at 2h. (Helwan, near Algiers, and near Mizusawa), 4h. (Helwan), 7h. (near Tokyo), 9h. (Helwan and near Ootomari), 10h. (near Balboa Heights), 13h. (Tiflis), 15h. (Hong Kong, Melbourne, Riverview, and Adelaide), 16h. (De Bilt and Uccle), 18h. (Riverview and Melbourne), 20h. (Coimbra), 21h. (Taihoku and Helwan).

Oct. 8d. Readings at 2h. and 7h. (Algiers), 11h. (Batavia and Tiflis).

Oct. 9d. 0h. 12m. 54s. Epicentre $15^{\circ}0'S$, $94^{\circ}0'E$.

$$A = -.067, B = +.963, C = -.259; \quad D = +.998, E = +.070; \\ G = +.018, H = -.258, K = -.966.$$

Very doubtful. It is possible that the epicentre should be in the neighbourhood of $9^{\circ}0'N$, $110^{\circ}0'E$, as on 1918 Aug. 16, but the residuals on that supposition are no better.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Batavia	14.3	57	3 42	- 2	6 42	+ 1	e 15.1	—
Perth	26.1	134	—	—	—	—	13.3	—
Kodaikanal	30.1	326	12 24	?S	(12 24)	+48	14.6	19.5
Hong Kong	42.3	29	4 32	?	13 21	-78	19.0	20.6
Taihoku	48.2	34	—	—	—	—	e 21.1	—
Melbourne	50.2	128	—	—	11 12	?PR ₁	32.5	38.2
Zi-ka-wei	53.2	30	e 9 54	+27	—	—	—	30.2
Riverview	54.6	121	—	—	—	—	e 28.7	34.1
Wellington	73.3	130	—	—	e 23 36	+150	e 39.6	47.1

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Helwan	E. 75.2	309	14 12	?PR ₁	—	—	—	47.8
	N. 75.2	309	23 42	?S	(23 42)	+134	—	49.8
Moncalieri		98.0	315	—	e 26 51	+75	51.3	—
Hamburg		98.5	323	—	—	—	e 57.1	62.1
De Bilt	E. 101.1	321	—	—	e 28 39	+153	e 58.1	64.1
	N. 101.1	321	—	—	e 27 11	+65	e 55.1	64.2
Uccle		101.4	320	—	e 27 6	+57	—	65.1
Paris		102.2	318	—	—	—	e 58.1	65.1
Tortosa		102.3	310	—	—	—	e 58.1	64.5
Kew		104.4	320	—	—	—	—	74.1
Oxford		105.0	320	—	—	—	—	64.3
Dyce	N. 105.9	326	27 56	?S	(27 56)	+65	—	60.1
Bidston		106.2	321	—	—	—	53.8	71.7
Eskdalemuir	N. 106.4	324	—	—	e 27 43	+47	51.1	61.6
Victoria		131.7	35	—	69 12?	?L	73.6	84.0
La Paz		143.9	211	22 32	?PR ₁	27 6	?	83.7
Toronto		150.8	350	—	—	—	92.3	—
Chicago		153.2	3	—	—	—	e 83.1	—

Additional readings: Batavia gives also $i = +5m.0s.$, $e = +5m.24s.$ Manila ($\Delta = 39^{\circ}.0$) gives $e = +4m.6s.$ Melbourne $P = 0h.12m.48s.$, $SR_1 = +18m.0s.$, $SR_2 = +22m.18s.$ Zi-ka-wei $MN = +29.0m.$ Riverview $e (P?) = 0h.9m.14s.$, $e (S?) = 0h.20m.3s.$, $MN = +34.2m.$ Wellington $eSR_1 = +28m.42s.$, $eSR_2 = +32m.42s.$ Moncalieri $S = +39m.36s.$ Strasbourg ($\Delta = 98^{\circ}.8$) gives simply $1h.13m.$ Eskdalemuir $eN = +35m.0s.$, $ME = +61.3m.$

Oct. 9d. Readings also at 1h. (La Paz and Batavia), 4h. (near Batavia), 5h. (Perth, Melbourne, Kodaikanal, Helwan, De Bilt, Uccle, and Eskdalemuir), 6h. (Riverview), 7h. (Toronto, Victoria, and La Paz), 14h. (Batavia), 15h. (Rocca di Papa), 16h. (La Paz), 17h. (Wellington (2)).

Oct. 10d. 2h. 6m. 0s. Epicentre $0^{\circ}.0$. $135^{\circ}.0E.$ (as on 1921 Mar. 1d.).

$A = -.707$, $B = +.707$, $C = .000$; $D = +.707$, $E = +.707$;
 $G = .000$, $H = .000$, $K = -1.000$.

An alternative solution with deep focus is given below.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Manila	20.1	317	e 5 25	+43	9 16	+51	10.5	11.6
Taihoku	28.2	334	e 6 41	+31	—	—	11.7	—
Batavia	28.8	257	e 6 54	+38	i 10 37	-36	—	—
Osaka	34.7	1	7 18	+7	—	—	—	15.9
Kobe	34.7	1	e 7 12	+1	—	—	11.2	—
Adelaide	35.1	175	7 18	+4	12 30	-27	—	21.6
Perth	36.7	209	7 7	-21	13 13	-7	—	—
Riverview	37.1	159	e 6 32	-59	e 11 43	-102	e 13.3	17.7
Sydney	37.1	159	—	—	11 36	-109	15.5	21.0
Melbourne	38.9	168	12 18	?	14 18	+27	15.2	20.6
Mizusawa	39.5	8	7 58	-7	—	—	—	—
Hakodate	42.1	7	e 7 32	-40	—	—	—	—
Apia	54.5	106	e 9 0	-36	e 17 0	-15	—	—
Wellington	54.7	144	e 12 18	?PR ₁	i 15 54	-83	24.6	—
Kodaikanal	58.1	282	12 54	?PR ₁	—	—	22.4	26.8
Honolulu	68.6	69	i 19 45	?S	i 19 45	-24	35.5	—
Victoria	97.8	41	(12 42)	-77	(23 31)	-123	23.5	50.1
Berkeley	100.0	51	e 13 45	-26	—	—	49.5	—
Helwan	101.8	300	19 0	?PR ₁	—	—	—	—
Vienna	108.6	322	14 49	-2	e 26 48	-27	—	67.0
Hamburg	109.9	329	19 0	?PR ₁	—	—	e 51.0	61.0
Pola	111.5	319	e 19 36	?PR ₁	(e 29 24?)	+102	e 29.4?	—
Pompeii	E. 112.6	315	20 44	?PR ₁	—	—	39.0	—
De Bilt	113.2	329	—	—	e 27 45	-11	e 52.0	61.7
Dyce	N. 113.4	336	20 3	?PR ₁	i 29 56	+119	56.5	71.4
Rocca di Papa	E. 113.5	317	i 18 55	[+22]	i 29 49	+111	e 37.3	—
	N. 113.5	317	i 18 51	[+18]	i 29 44	+106	e 37.2	—
Strasbourg	113.6	324	e 18 47	[+14]	e 31 24	?	e 60.0	63.4
Uccle	114.3	328	e 18 52	[+17]	27 42	-22	e 52.0	60.0
Edinburgh	114.7	334	—	—	30 9	+121	—	66.0

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Eskdalemuir	115.1	334	20 17	?PR ₁	30 5	+114	48.0	83.6
Besançon	115.3	323	18 56?	[+17]	30 46	+154	60.0	—
Moncalieri	115.4	320	e 17 28	+126	28 12	— 1	46.2	75.2
Stonyhurst	115.7	333	20 30	?PR ₁	—	—	(e 59.4)	78.5
Bidston	116.3	333	22 5	?PR ₁	—	—	e 57.3	76.5
Kew	116.3	330	—	—	—	—	—	75.0
Paris	116.4	326	e 18 48	[+ 6]	e 30 55	+154	59.0	66.0
Oxford	116.6	331	—	—	—	—	46.0	64.4
Marseilles	117.6	320	e 19 44	[+58]	—	—	e 54.0?	78.0
Tortosa	122.0	320	e 18 0	[-58]	—	—	e 55.0	67.8
Algiers	122.3	315	19 7	[+ 8]	24 24	?	38.0	—
Granada	126.7	318	i 19 18	[+ 8]	30 6	+28	—	—
Toronto	126.7	30	—	—	(32 24)	?	62.0	—
Coimbra	127.8	324	e 19 20	[+ 7]	i 22 33	?PR ₁	e 59.0	—
San Fernando	128.8	319	23 0	?PR ₁	—	—	—	73.5
La Paz	151.8	127	i 19 50	[- 9]	e 33 21	?	66.0	72.0

Additional readings: Manila gives also MN = +11.5m. Batavia i = 7m.41s. and +9m.25s. Riverview eP = +7m.2s. and +8m.19s., eS = +11m.33s., MZ = +18.5m. Osaka MN = +17.9m. Kobe P has been increased by 12m. Hakodate reading is given as at 7h. Mizusawa SN = +7m.56s. Honolulu SN = +27m.2s., SR₁N = +31m.7s. Berkeley LE = +51.5m. Helwan PN = +21m.0s. Algiers P = +32m.26s. Rocca di Papa eN = +18m.46s., eSE = +29m.40s., e = +33m.16s., eL = +35.4m. De Bilt ePR₁ = +20m.9s., eN = +27m.52s., e = +29m.50s., MN = +60.1m., T₀ = 2h.6m.28s. Epicentre 5°0S. 139°7E. Dyce i = +40m.13s. and +49m.3s. Uccle e = +20m.7s. and +30m.0s. Eskdalemuir MN = +82.9m. Stonyhurst gives eP and eL as eP of independent shocks. Paris MN = +62.0m. Toronto readings both given as L. Coimbra iN = +22m.37s. San Fernando MN = +86.7m.

Oct. 10d. 2h. 6m. 30s. Epicentre 5°0S. 135°0E.

$$A = -.704, B = +.704, C = -.087; \quad D = +.707, E = +.707; \\ G = +.062, H = -.062, K = -.996.$$

A depth 0.060 of focus is assumed. An alternative solution without deep focus is given above.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	-3.0	24.0	325	e 4 55	+ 2	8 46	+ 2	10.0	11.1
Batavia	-3.5	28.0	266	e 6 24	+51	i 10 7	+13	—	—
Adelaide	-3.7	30.1	174	6 48	+56	12 0	+90	—	21.1
Perth	-3.9	32.4	211	6 37	+24	12 43	+95	—	—
Taihoku	-4.0	32.7	340	e 6 11	- 4	(11 15)	+ 3	11.2	—
Riverview	-4.1	33.3	153	e 6 2	-18	e 11 13	- 7	e 12.8	17.2
Sydney	-4.1	33.3	153	—	—	11 6	-14	15.0	20.5
Melbourne	-4.1	34.0	165	11 48	?S	(11 48)	+16	14.7	20.1
Osaka	-4.7	39.7	1	6 48	-25	—	—	—	15.4
Kobe	-4.7	39.7	1	e 6 42	-31	—	—	10.7	—
Mizusawa	-5.1	44.5	8	7 28	-22	—	—	—	—
Hakodate	-5.3	47.0	6	e 7 2	-67	—	—	—	—
Wellington	-5.6	50.8	142	e 11 48	?	i 15 24	+ 6	24.1	—
Apia	-5.8	53.1	103	9 30	+41	16 30	+45	—	—
Kodaikanal	-6.2	59.3	285	12 24	?PR ₁	13 48	?	21.9	26.3
Honolulu	-6.8	70.6	67	i 19 15	?S	(i 19 15)	+ 4	35.0	—
Victoria	-7.8	101.5	42	(12 12)	-84	(23 12)	-101	23.0	49.6
Berkeley	-7.9	102.5	53	e 13 15	-26	—	—	49.0	—
Helwan	-7.9	104.3	299	18 30	?PR ₁	—	—	—	—
Vienna	—	112.5	320	e 14 19	-50	e 26 18	-92	—	66.5
Hamburg	—	114.2	327	18 30	?PR ₁	—	—	e 50.5	60.5
Pola	—	115.3	318	e 19 6	?PR ₁	(e 28 54?)	+42	e 28.9?	—
Pompeii	—	116.1	312	20 14	?PR ₁	—	—	38.5	—
Rocca di Papa	N.	—	117.1	314	i 18 21	[-23]	i 29 14	+47	e 36.7
—	E.	—	117.1	314	i 18 25	[-19]	i 29 19	+52	e 36.8
De Bilt	—	—	117.5	327	—	e 27 15	-45	e 51.5	61.2
Strasbourg	—	—	117.7	321	e 18 17	[-29]	e 30 54	?	e 59.5
Dyce	N.	—	118.0	335	19 33	?PR ₁	29 26	+52	56.0
Uccle	—	—	118.8	326	e 18 22	[-27]	e 27 12	-87	e 51.5
Moncalieri	—	—	119.2	319	e 16 58	+79	27 42	-61	45.7

Continued on next page.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	°	m. s.	s.	m. s.	s.	m.	m.
Edinburgh	—	119.2	333	—	—	29 39	+56	—	65.6
Besançon	—	119.3	321	18 26 ?	[-25]	30 16	+92	59.5	—
Eskdalemuir	—	119.7	333	19 47	[+56]	29 35	+48	47.5	83.1
Stonyhurst	—	120.2	331	e 20 0	? PR ₁	—	—	(e 58.9)	78.0
Paris	—	120.6	325	e 18 18	[-36]	e 30 25	+91	58.5	65.5
Kew	—	120.7	330	—	—	—	—	—	74.5
Bidston	—	120.8	331	21 35	? PR ₁	—	—	e 56.8	76.0
Oxford	—	120.9	330	—	—	—	—	45.5	63.9
Marseilles	—	121.5	318	e 19 14	[+17]	—	—	e 53.5?	77.5
Tortosa	—	125.8	317	e 17 30	[-97]	—	—	e 54.5	67.3
Algiers	—	125.8	312	18 37	[-31]	23 54	? PR ₁	37.5	—
Granada	—	130.4	315	i 18 48	[-31]	29 36	?	—	—
Toronto	—	130.9	31	—	—	(31 54)	?	61.5	—
Coimbra	—	131.8	321	e 18 50	[-33]	i 22 3	? PR ₁	e 58.5	—
San Fernando	—	132.6	316	22 30	? PR ₁	—	—	—	73.0
La Paz	—	148.6	134	i 19 20	[-34]	e 32 51	?	65.5	71.5

Oct. 10d. 8h. 30m. 20s. Epicentre 37° -5N. 134° -5E. (as on 1921 June 25d.).

$$A = -.556, B = +.566, C = +.609; \quad D = +.713, E = +.701; \\ G = -.425, H = +.434, K = -.793.$$

	Δ	Az.	P.	O-C.	S.	O-C.	M.
	°	°	m. s.	s.	m. s.	s.	m.
Osaka	2.9	165	0 43	- 2	(1 26)	+ 6	2.1
Tokyo	4.8	113	e 1 13	- 1	(1 58)	-13	2.0
Mizusawa	5.4	71	1 27	+ 4	2 41	+13	—

Osaka MN = +1.5m. S is given as L.

Oct. 10d. Readings also at 2h. (Belgrade and Kodaikanal), 12h. (La Paz), 15h. (St. Louis), 21h. (Taihoku).

Oct. 11d. Readings at 1h. (Nagasaki), 2h. (Tokyo), 4h. (near La Paz), 6h. (Zi-ka-wei and Hong Kong), 7h. (Batavia), 10h. (Manila), 14h. and 17h. (Hong Kong).

Oct. 12d. 7h. 52m. 12s. Epicentre 46° -7N. 145° -8E. (as on 1920 Feb. 22d.).

$$A = -.567, B = +.386, C = +.728; \quad D = +.562, E = +.827; \\ G = -.602, H = +.409, K = -.686.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	2.1	270	1 11	+38	(1 11)	+13	2.0	2.2
Hakodate	6.1	218	e 1 42	+ 9	—	—	2.9	3.9
Mizusawa	8.3	206	2 5	- 1	3 39	- 6	—	—
Mito	11.0	203	2 59	+15	—	—	5.4	6.3
Tyosi	11.6	200	2 48	- 5	(4 45)	-24	4.8	5.2
Tokyo	11.9	205	e 3 5	+ 7	3 42	-95	4.9	6.2
Osaka	14.3	217	4 22	+52	—	—	—	7.4
Hukuoka	17.5	227	4 15	+ 4	—	—	—	7.9
Zi-ka-wei	24.3	239	e 5 30	- 1	—	—	—	—
Manila	38.2	220	e 7 48	+ 8	—	—	—	—
Batavia	63.1	225	e 10 31	- 2	i 18 52	-10	—	—
Kodaikanal	67.8	264	67 6	?	—	—	—	—
Dyce	72.7	344	—	—	—	—	72.3	79.0
Hamburg	73.0	335	—	—	e 20 48	-14	e 70.8	81.8
Edinburgh	74.2	343	—	—	—	—	69.8	—
Eskdalemuir	74.7	343	—	—	e 21 21	- 1	64.8	—
Vienna	75.3	329	i 11 52	+ 1	21 48	+19	e 40.8	71.8
De Bilt	75.6	336	—	—	e 21 35	+ 2	e 64.8	75.0
Bidston	76.5	340	—	—	i 21 41	- 2	69.0	75.4

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Uccle	77.0	337	—	—	—	—	e 63.8	69.8
Kew	77.6	340	—	—	—	—	—	80.8
Strasbourg	78.0	332	—	—	e 38 48	?L	69.6	—
Paris	79.3	338	e 22 15	?S	(e 22 15)	0	69.8	72.8
Padova	79.4	330	12 35	+20	22 22	+ 6	—	—
Riverview	80.7	175	e 32 54	?	—	—	e 70.2	72.2
Moncalieri	81.2	331	e 20 51	?S	34 32	?	51.2	—
Rocca di Papa	82.2	326	i 12 27	- 4	i 22 42	- 6	e 66.1	80.1
Helwan	E. 83.4	308	23 12	?S	(23 12)	+11	—	73.2
	N. 83.4	308	21 12	?S	(21 12)	-109	—	72.2
Marseilles	83.4	332	—	—	—	—	—	67.8
Melbourne	84.2	181	—	—	—	—	—	66.3
Rio Tinto	92.0	340	62 48	?L	—	—	(62.8)	68.8
San Fernando	93.2	339	60 12	?L	—	—	(60.2)	68.2
Cape Town	138.7	268	20 47	[+70]	—	—	—	—
La Paz	138.8	54	20 41	[+63]	i 27 42	?	38.1	48.0

Additional readings: Ootomari gives also MN = +2.1m. Hakodate MN = +3.6m. Mizusawa SN = +3m.38s. Tyosi MN = +6.3m. Tokyo MN = +7.4m. Osaka MN = +7.3m. Hamburg MN = +78.7m. De Bilt MN = +73.8m. Epicentre 42°2N. 146°5E. San Fernando MN = +65.2m. La Paz LN = +35.2m., LE = +35.9m., T₀ = 8h.4m.2s. Possibly an independent shock.

Oct. 12d. Readings also at 0h. (La Paz), 8h. (Belgrade and Mizusawa), 9h. (Mizusawa), 10h. (Taihoku), 13h. (La Paz), 16h. (near Mizusawa), 18h. (Colombo).

Oct. 13d. Readings at 1h. (Apia), 6h. (Colombo), 9h. (La Paz), 12h. (Hong Kong (2) and Zi-ka-wei), 13h. and 16h. (La Paz), 19h. (near Kobe and Osaka, and near Tacubaya).

1921. Oct. 14d. 16h. 43m. 45s. Epicentre 30°5N. 91°0E.

A = -015, B = +.861, C = +.508; D = +1.000, E = +.017;
G = -.009, H = +.508, K = -.862.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Calcutta	E. 8.4	197	2 9	+ 2	3 45	- 2	4.8	5.8
Dehra Dun	11.2	272	2 15	-32	—	—	—	—
Simla	11.9	277	e 5 45	?L	—	—	(e 5.8)	—
Bombay	20.2	239	10 46	?L	—	—	(10.8)	—
Hong Kong	22.3	106	5 9	0	9 15	+ 4	11.7?	12.8
Colombo	25.8	206	6 15	+29	10 39	+21	16.8	20.6
Zi-ka-wei	26.0	81	e 5 49	+ 1	e 10 29	+ 7	—	17.4
Taihoku	27.5	94	—	—	e 11 0	+10	15.6	—
Manila	31.8	114	—	—	e 12 19	+14	—	—
Osaka	37.4	71	9 31	?PR ₁	—	—	—	23.5
Batavia	39.7	155	e 8 46	+54	i 9 30	?PR ₁	23.4	—
Tokyo	40.7	70	e 8 59	+58	—	—	—	27.5
Helwan	E. 50.9	284	12 51	?PR ₁	—	—	—	36.8
	N. 50.9	284	16 39	?S	(16 39)	+ 9	—	35.2
Lemberg	52.7	312	e 7 51	-93	—	—	e 32.2	35.6
Belgrade	55.8	306	e 3 20	-385	e 11 27	-364	e 17.8	28.7
Budapest	56.3	311	—	—	e 18 15	+37	e 22.2	33.2
Vienna	57.9	312	e 9 57	- 1	e 17 57	- 1	e 31.2	43.8
Pola	60.4	309	—	—	e 18 34	+ 6	e 28.2	39.4
Hamburg	60.8	319	—	—	e 21 15	?	31.2	35.4
Rocca di Papa	N. 62.1	304	e 10 27	+ 1	18 47	- 2	e 34.6	43.8
Strasbourg	63.4	313	e 10 56	+22	—	—	32.9	37.9
De Bilt	E. 64.0	318	—	—	e 19 18	+ 5	e 31.2	37.1
	N. 64.0	318	—	—	—	—	e 30.2	37.0
Moncalieri	64.5	310	—	—	19 28	+ 9	34.4	39.6
Uccle	64.8	317	—	—	—	—	32.2	37.4
Besançon	64.9	312	—	—	—	—	31.2	—
Dyce	N. 66.3	325	—	—	—	—	33.8	35.3

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		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Paris		66.6	315	—	—	e 27 15	?L	34.2	42.2
Marseilles		66.7	308	—	—	—	e	36.2	41.2
Kew		67.3	319	—	—	—	—	—	45.2
Edinburgh		67.3	322	—	—	—	—	35.2	39.1
Eskdalemuir	N.	67.5	322	—	—	e 20 3	+ 7	32.2	37.4
Stonyhurst		67.7	320	e 20 45	?S	(20 45)	+47	—	41.2
Oxford		67.8	319	—	—	—	—	34.0	44.6
Tortosa		70.9	308	20 35	?S	(20 35)	- 2	e 36.2	41.1
Río Tinto		77.2	308	32 15	?L	—	—	(32.2)	50.2
Coimbra	E.	77.4	310	22 33	?S	(22 33)	+40	38.1	45.6
	N.	77.4	310	—	—	—	—	41.9	45.8
San Fernando		77.6	306	—	—	—	—	45.5	50.2
Cape Town		94.0	232	49 33	?L	—	—	(49.6)	—
Victoria		95.2	22	—	—	47 1	?L	51.4	61.8
Berkeley	Z.	105.0	27	e 39 15	?L	—	—	(e 39.2)	—
Toronto		105.3	352	—	—	—	—	63.6	71.8
Chicago		107.7	358	—	—	—	—	e 63.0	—
La Paz		156.4	302	e 20 27	[+23]	—	—	79.2	82.8

Additional readings: Zi-ka-wei gives also PSN = +10m.39s., PSE = +10m.45s., MN = +15.6m. Osaka MN = +21.4m. Tokyo MN = +30.0m. Belgrade eLN = +17.0m. There appears to be an error in the time. Hamburg MZ = +41.6m. Rocca di Papa ePE = +10m.24s., also the following: e?? = +8m.3s., eE = +9m.15s., eN = +9m.27s. De Bilt e = +26m.25s. Epicentre 29° 9N. 90° 4E. Paris MN = +39.2m. Moncalieri e = +4m.27s., MN = +42.5m. Eskdalemuir eN = +27m.15s., ME = +37.7m. Tortosa S? = +28m.30s. Coimbra S? = +30m.43s. San Fernando MN = +51.4m. La Paz P = +21m.1s.

Oct. 14d. Readings also at 5h. (Vera Cruz), 15h. (Nagasaki), 17h. (Batavia and near Belgrade), 18h. (Rocca di Papa).

1921. Oct. 15d. 4h. 58m. 5s. Epicentre 14° 0S. 166° 5E.

A = - .943, B = + .227, C = - .242 ; D = + .233, E = + .972 ;

G = + .235, H = - .056, K = - .970.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Apia		21.1	92	i 4 51	- 3	—	—	—	9.6
Riverview		24.2	212	i 5 26	- 4	e 10 3	+15	e 11.4	12.4
Sydney	E.	24.2	212	4 7	-83	9 25	-23	12.9	14.2
Wellington		28.2	167	e 6 13	+ 3	i 10 43	-20	12.9	14.9
Adelaide		32.7	226	i 6 55	+ 1	i 12 7	-12	e 14.3	20.0
Honolulu	E.	49.6	45	e 9 6	+ 2	(16 6)	- 8	23.0	28.5
	N.	49.6	45	—	—	—	—	22.8	27.1
Manila		53.3	300	e 9 35	+ 7	—	—	—	—
Tokyo		55.7	334	i 5 22	?	e 12 24	?PR ₁	e 20.5	24.4
Osaka		56.9	330	10 0	+ 9	17 52	+ 7	26.5	31.4
Kobe		57.0	330	e 9 49	- 3	—	—	—	—
Mizusawa	N.	58.2	339	9 54	- 6	18 1	0	—	—
Nagasaki		58.4	325	10 0	- 1	18 9	+ 5	24.8	—
Taihoku		58.6	313	e 10 7	+ 4	(18 23)	+17	18.4	—
Hukuoka		58.7	326	10 33	+30	18 35	+28	25.2	30.5
Batavia		59.0	271	10 13	+ 8	—	—	e 25.9	27.9
Hakodate		60.6	340	e 10 53	+37	—	—	—	12.2
Zi-ka-wei		62.5	319	e 10 30	+ 1	e 18 50	- 5	—	—
Hong Kong		62.8	307	10 31	0	(19 18)	+20	19.3	20.2
Berkeley		84.4	49	e 12 52	+ 8	e 14 20	?	e 39.3	39.9
Calcutta	E.	84.7	295	13 13	+27	(23 25)	+ 9	23.4	—
Victoria		87.9	39	12 33	-31	(22 52)	-59	22.9	51.4
Columbo		88.3	277	10 25	-162	(23 55)	0	23.9	63.7
Tucson	E.	91.4	57	—	—	e 25 41	+73	42.8	46.4
Kodaikanal		91.6	280	12 19	-66	—	—	57.1	61.7
Simla		96.6	300	e 24 13	?S	(e 24 13)	-69	—	41.5
St. Louis		109.0	53	—	—	e 28 55	+96	e 57.0	58.4

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		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Chicago		111.1	50	19 25	?PR ₁	28 55	+77	e 51.9	—
Ann Arbor		114.0	49	—	—	—	—	58.9	—
Toronto		117.0	46	i 21 25	?PR ₁	30 7	+101	63.7	73.9
La Paz		118.0	119	e 15 24	-10	28 26	-8	55.2	59.4
Ithaca		119.3	48	—	—	—	—	52.9	—
Georgetown	E.	119.3	51	e 22 22	?PR ₁	30 22	+98	61.0	—
	N.	119.3	51	e 22 25	?PR ₁	30 22	+98	61.4	—
Washington		119.3	51	—	—	—	—	e 51.9	—
Ottawa		119.3	44	—	—	e 29 55	+71	e 56.9	—
Cheltenham		119.4	51	—	—	(27 40)	-65	49.4	—
Fordham		121.5	50	—	—	—	—	—	118.4
Cape Town		123.2	212	53 14	?L	—	—	(53.2)	—
Lemberg		132.9	326	e 14 31	? e 23 7	—	?PR ₁	—	23.2
Helwan	E.	135.8	299	19 55	[+23]	—	—	—	98.6
	N.	135.8	299	25 7	—	—	—	—	115.7
Dyce	E.	135.9	352	i 22 56	?PR ₁	—	—	64.9	77.0
	N.	135.9	352	i 22 21	?PR ₁	—	—	64.4	76.9
Hamburg	Z.	136.3	340	e 19 24	[-9]	—	—	e 62.9	80.1
Budapest		137.0	328	e 18 51	[-43]	—	—	e 39.9	69.9
Edinburgh		137.4	351	e 22 55	?PR ₁	—	—	61.9	78.9
Vienna		137.8	330	i 19 27	[-9]	e 29 41	? e 46.9	—	79.5
Belgrade		137.8	323	e 19 30	[-6]	e 33 20	? e 69.5	—	—
Eskdalemuir	N.	137.9	351	e 19 31	[-5]	—	—	64.9	119.8
De Bilt		139.1	342	e 19 39	[+1]	e 22 18	?PR ₁	e 63.9	74.2
Stonyhurst		139.2	349	e 22 13	?PR ₁	35 43	? 70.3	—	123.9
Uccle		140.5	342	e 19 33	[-7]	—	—	—	80.0
Oxford		141.0	347	—	—	—	—	—	81.7
Kew		141.1	347	25 55	?PR ₁	—	—	—	116.9
Strasbourg		141.2	336	19 36	[-5]	e 32 42	? 71.6	—	81.5
Pola		141.4	329	e 19 50	[+8]	—	—	e 61.0	76.0
Padova		142.0	331	19 44	[+1]	—	—	—	—
Paris		142.8	343	e 19 58	[+13]	—	—	68.9	81.9
Besançon		143.0	336	20 12?	[+27]	—	—	72.9	—
Pompeii	E.	143.8	322	19 55	[+8]	—	—	76.9	—
Moncalieri		144.2	332	19 42	[-5]	31 33	? 47.5	—	82.2
Rocca di Papa		144.2	325	i 19 35	[-12]	e 25 3	?PR ₁	e 66.6	—
Marseilles		146.5	333	e 19 55	[+4]	—	—	e 73.9	87.9
Barcelona		149.4	334	e 19 49	[-6]	—	—	e 38.8	—
Tortosa		150.5	338	19 55	[-1]	33 32	? 61.2	—	107.4
Algiers		152.8	330	19 54	[-6]	30 49	? 46.9	—	84.9
Coimbra	E.	153.4	351	20 14	[+14]	30 42	? 44.8	—	90.5
	N.	153.4	351	—	—	—	—	48.4	98.7
Granada		155.2	341	20 20	[+18]	—	—	—	—
San Fernando		156.6	345	20 13	[+9]	—	—	—	115.7

Additional readings: Apia gives also +5m.18s., T₀=4h.57m.22s. Riverview
 iP = +5m.54s. and +6m.23s., eS = +10m.23s. and +10m.51s., MN = +12.2m.,
 MZ = +14.4m., T₀=4h.57m.36s. Epicentre 11°-0S. 165°-0E. Adelaide
 i = +11m.55s. and +12m.13s. Honolulu gives S as P and SE = +20m.20s.,
 SN = +20m.45s. Osaka MN = +29.9m. Mizusawa PE = +9m.50s.
 Batavia i = +11m.58s. and +19m.9s., iE = +19m.48s. Berkeley LN =
 +39.5m. Victoria S = +16m.58s., MZ = +49.9m. Tucson eSE =
 +30m.19s. St. Louis e = +23m.37s. Chicago SR₁ = +35m.10s.
 Ann Arbor LN = +59.1m. Toronto SR₁ = +36m.37s., i = +50m.13s.,
 eL = +65.8m., and +77.0m. La Paz iP? = +19m.15s., iSR₁ = +30m.15s.,
 L (rep.) = 6h.51m.20s. Ithaca L = +59.9m. Georgetown eLE =
 +37.1m., LN = +37.5m. Ottawa eSR₁?E = +36m.42s. Cheltenham
 S given as PR₁E, also SE = +34m.6s. (?SR₁), MN = +72.7m. Dyce iN =
 +23m.14s., iE₁ = +31m.26s. Hamburg iZ = +22m.28s., eE = +23m.10s.,
 iN = +23m.18s., ME = +66.1m., MNZ = +80.1m. Budapest e =
 +21m.55s. Vienna iN = +22m.38s. Belgrade iPE = +20m.17s., PR₁N =
 +21m.52s., PR₂E = +22m.32s., PR₃ = +23m.15s., PR₁E = +25m.51s.,
 PR₁N = +29m.32s., eLN = +69.6m. Eskdalemuir iN = +22m.28s., and
 +23m.21s., ME = +79.2m. De Bilt MN = +82.0m. Uccle PR₁ =
 +22m.53s., SR₁ = +33m.5s. Strasbourg MN = +76.8m., MZ = +83.9m.
 Pola MN = +81.8m. Padova PR₁N = +22m.3s., PR₁E = +24m.19s.
 Paris MN = +72.9m. Pompeii LE = +41.9m. Moncalieri MN =
 +89.3m. Rocca di Papa PR₁E = +20m.19s., PR₁N = +20m.25s. Algiers
 MN = +100.9m. San Fernando MN = +115.8m.

Oct. 15d. Readings also at 1h. (Calcutta), 2h. (Eskdalemuir, De Bilt, Uccle, and Helwan), 6h. (Rocca di Papa and Manila), 7h. (near Hakodate), 8h. (near Mizusawa), 10h. (Colombo, Kodaikanal, Helwan, and Rocca di Papa), 15h. (Apia), 16h. (Dehra Dun).

Oct. 16d. Readings at 3h. (La Paz), 7h. (Calcutta), 8h. (De Bilt), 10h. (near Tokyo), 22h. (near Batavia and Padova), 23h. (La Paz).

Oct. 17d. Readings at 0h. (near Taihoku), 1h. (Batavia and Zi-ka-wei), 6h. (Strasbourg), 8h. (Apia and Zi-ka-wei), 11h. (La Paz and near Balboa Heights), 16h. (De Bilt), 20h. (2) and 21h. (Batavia), 23h. (Lick).

Oct. 18d. 0h. 27m. 50s. Epicentre $18^{\circ}08.173^{\circ}5E$. (as on 1920 Jan. 1d.).

$$A = -.945, B = +.108, C = -.309; \quad D = +.113, E = +.994; \\ G = +.307, H = -.035, K = -.951.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	14.8	76	2 10	-86	—	—	—	—
Riverview	25.5	227	e 5 46	+ 3	e 10 18	+ 5	e 12.9	14.8
Christchurch	25.6	181	—	—	11 58	?L	19.2	21.2
Adelaide	35.3	234	—	—	e 12 34	-26	e 17.8	21.7
Honolulu	48.3	39	—	—	—	—	e 25.2	—
Perth	53.5	243	—	—	16 40	-23	—	—
Batavia	65.9	273	e 11 15	+25	i 18 40	-56	—	—
Berkeley	82.1	46	—	—	—	—	e 41.7	—
Lick	82.4	46	—	—	—	—	i 38.4	—
Kodaikanal	98.9	279	57 10	?L	—	—	(57.2)	—
Chicago	108.4	51	—	—	—	—	e 55.2	—
Stonyhurst	143.9	355	e 83 40	?L	—	—	(e 83.7)	—
Helwan	E. 144.2	297	85 10	?L	—	—	(85.2)	—
De Bilt	E. 144.7	348	—	—	—	—	e 72.2	84.0
	N. 144.7	348	—	—	—	—	e 75.2	79.5
Uccle	146.1	349	—	—	—	—	e 71.2	—
Rocca di Papa	151.1	330	e 20 6 [+ 9]	—	—	—	—	—

Additional readings and notes: Riverview MN = +14.3m. Lick gives its reading 1h. too early. Helwan gives also PN = +89m.10s. Rocca di Papa ePN = +20m.13s.

Oct. 18d. 11h. 57m. 5s. Epicentre $18^{\circ}08.173^{\circ}5E$. (as at 0h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	25.5	227	e 6 13	+30	e 10 13	0	e 11.9	12.8
Adelaide	35.3	234	—	—	—	—	—	20.7
Kodaikanal	98.9	279	57 7	?L	—	—	(57.1)	—
Chicago	108.4	51	—	—	—	—	e 54.9	—
La Paz	110.2	118	36 36	?SR ₁	—	—	—	—
Helwan	E. 144.2	297	83 55	?L	—	—	(83.9)	—
De Bilt	144.7	348	—	—	—	—	73.9	—

Additional readings: Riverview gives P as e?, MN = +13.9m. Helwan PN = +90m.55s.

Oct. 18d. Readings also at 20h. (near Tortosa), 21h. (La Paz).

Oct. 19d. Readings at 3h. (Riverview), 5h. (Manila), 8h. and 11h. (La Paz) 12h. (La Paz and Colombo), 14h. (Manila), 22h. (near Lick and near La Paz), 23h. (near Lick).

1921. Oct. 20d. 6h. 3m. 15s. Epicentre 18° OS. 66° OW.

A = +.387, B = -.869, C = -.309; D = -.914, E = -.407;

G = -.126, H = +.282, K = -.951.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
La Paz		2.5	306	i 1 3	+24	1 43	+34	(1.7)	—
Rio de Janeiro	E.	21.9	107	i 4 52	-12	10 3	+60	15.1	15.8
	N.	21.9	107	i 5 15	+11	10 25	+82	13.8	15.0
Balboa Heights	E.	30.1	334	6 5	-21	11 5	-31	14.8	12.0
	N.	30.1	334	6 3	-26	11 3	-33	—	12.0
Porto Rico		36.2	2	7 23	-1	12 54	-19	16.0	16.3
Vera Cruz		47.5	320	8 18	-33	—	—	—	17.2
Tacubaya		49.6	318	8 43	-21	15 42	-32	20.3	—
Cheltenham	E.	57.7	352	—	—	17 51	-4	25.4	—
	N.	57.7	352	10 2	+5	18 0	+5	25.5	38.4
Georgetown	E.	57.8	351	e 9 58	0	i 17 55	-1	38.2	—
	N.	57.8	351	i 9 58	0	i 17 54	-2	e 25.2	—
	Z.	57.8	351	i 9 52	-6	17 50	-6	32.3	—
Washington		57.8	351	9 53	-5	17 53	-3	e 35.2	—
St. Louis		61.0	340	(i 10 11)	-8	i 10 11	?P	—	18.3
Ithaca		61.2	353	e 10 20	0	e 18 38	0	26.2	—
Ann Arbor		61.9	348	10 21	-3	19 39	+52	—	—
Toronto		62.8	350	—	—	i 19 27	+29	e 32.8	36.0
Chicago		63.0	344	9 51	-41	18 17	-44	28.8	—
Ottawa		64.0	355	10 35	-3	19 11	-2	e 29.8	—
Tucson	E.	66.1	320	10 40	-12	18 53	-45	28.0	—
Azores		67.4	35	20 9	?S	(20 9)	+14	—	—
Cape Town		75.6	122	11 48	-5	21 23	-10	—	21.5
Lick	N.	76.2	319	e 11 52	-4	i 21 15	-24	—	—
Berkeley		76.9	319	i 11 43	-17	i 21 22	-26	e 37.8	—
San Fernando		78.4	46	12 16	+7	22 24	+19	34.2	52.6
Coimbra	E.	79.1	41	12 8	-6	i 22 16	+3	37.8	44.6
	N.	79.1	41	—	—	i 22 20	+7	—	44.5
Granada		80.5	47	i 12 21	-1	22 31	+2	—	—
Victoria		83.7	327	11 14	-86	(i 21 4)	-122	i 20.1	24.0
Algiers		85.0	49	12 44	-4	i 23 6	-13	e 39.8	51.8
Tortosa		85.2	45	12 50	+1	i 23 3	-18	36.0	—
Barcelona		86.5	45	e 12 57	+1	i 23 11	-25	—	24.3
Bidston		89.4	34	13 34	+22	23 28	-39	—	—
Oxford	E.	89.5	35	i 13 35	+22	i 23 24	-45	—	49.8
Kew		89.9	35	—	—	—	—	—	26.8
Stonyhurst		90.0	34	13 3	-13	(23 27)	-47	23.4	24.6
Paris		90.2	39	e 13 38	+21	i 23 29	-47	49.8	56.8
Eskdalemuir		90.4	30	i 13 40	+22	23 31	-47	37.8	51.4
Edinburgh		90.7	30	e 13 40	+20	i 23 35	-46	38.8	46.4
Besançon		91.5	41	13 44?	+20	23 39	-50	38.8	—
Moncalieri		91.7	43	13 50	+25	23 38	-54	38.6	58.2
Dyce		92.0	29	i 17 22	?PR ₁	i 23 37	-58	—	—
Uccle		92.1	37	e 13 15	-13	i 23 42	-54	40.8	53.7
De Bilt		93.2	36	e 14 0	+27	i 23 48	-59	e 46.8	54.6
Strasbourg		93.2	40	e 13 25	-8	23 48	-59	e 38.8	53.0
Zurich		93.2	42	e 13 27	-6	i 23 48	-59	—	—
Rocca di Papa	E.	93.8	48	i 13 24	-13	23 52	-62	e 46.4	—
	N.	93.8	48	i 13 35	-2	—	—	e 44.2	—
Padova		94.6	44	13 17	-24	23 52	-70	50.0	—
Pompeii	E.	94.8	49	15 45	+123	23 55	-69	60.8	—
Pola		95.7	45	e 13 27	-20	e 24 12	-61	40.8?	56.6
Hamburg		96.4	36	e 13 41	-10	i 24 7	-73	e 46.8	56.8
Wellington		98.3	222	e 13 3	-59	i 23 39	-120	—	45.6
Vienna		98.4	41	17 16	?PR ₁	i 24 10	-90	e 32.2	57.8
Budapest		99.9	43	e 17 33	?PR ₁	e 24 1	-114	e 31.8	—
Belgrade		100.1	46	e 16 8	+117	24 34	-83	e 32.3	—
Athens		100.7	54	e 14 15	+1	i 24 23	-99	e 50.8	59.1
Helwan		105.0	63	18 9	?PR ₁	—	—	—	—
Riverview		117.2	215	19 22	?PR ₁	e 28 58	+30	47.8	56.5
Perth		130.0	183	11 35	?	—	—	—	—
Kodaikanal		143.8	98	22 39	?PR ₁	—	—	36.4	37.6
Simla		144.2	61	e 41 33	?SR ₁	—	—	—	—
Colombo		144.9	103	19 45	[-3]	29 33	?	43.0	44.6
Mizusawa	E.	148.4	317	e 19 27	[-26]	20 4	?	—	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	151.2	313	e 19 27	[-30]	—	—	—	25.0
Batavia	154.8	163	e 19 55	[-7]	i 23 51	?	i 43.1	—
Calcutta	155.5	75	19 51	[-11]	32 51	?	44.8	—
Zi-ka-wei	165.2	334	e 20 13	[+1]	—	—	—	—
Taihoku	170.1	316	e 19 45	[-30]	—	—	—	—
Manila	172.5	244	18 45	[-91]	—	—	—	—
Hong Kong	175.7	358	20 11	[-6]	—	—	—	—

Additional readings and notes: La Paz gives also iSN = +1m.38s. George-town iz = +10m.25s., iN = +10m.29s., eLZ? = +24.4m. Ithaca i = +10m.50s., e = +15m.15s., and i = +19m.31s. Toronto SR₁ = +23m.21s., SR₂ = +27m.33s., iL = +29.2m. Ottawa iN = +11m.6s., PR₁NV? = +13m.27s., i = +20m.7s. and +21m.14s., SR₁? = +24m.13s., SR₂? = +26m.35s., T₀ = 6h.3m.15s. Berkeley i = +22m.18s. San Fernando MN = +55.2m. Coimbra iN = +22m.30s. and +23m.22s., T₀ = 6h.3m.13s. Victoria SR = +14m.41s. (?PR₁), iL = +21.1m. Barcelona MN = +24.7m. Oxford PR₁ = +16m.43s. Stonyhurst S = +16m.45s. Paris PR₁ = 17m.29s. Eskdalemuir eE? = +13m.20s., e = +16m.52s., iE = +17m.41s., MN = +50.5m. Moncalieri MN = +53.2m. Uccle PR₁ = +16m.56s., SR₁ = +29m.19s. De Bilt ePR₁ = +17m.10s., MN = +54.8m. Strasbourg MN = +64.1m. Rocca di Papa ePN = +13m.18s., PR₁E = +16m.39s., PR₁N = +16m.45s. Padova PR₁N = +19m.35s., SR₁N = +25m.2s. and SR₁E = +27m.7s. Pola PR₁ = +17m.41s., MN = +58.7m. Hamburg PR₁ = +17m.39s., iSN = +24m.9s., iPSE = +25m.5s. Wellington ePR₁ = +17m.39s., SR₂ = +44m.39s., T₀ = 6h.3m.26s. Vienna iZ = +17m.55s., iE = +25m.11s., iN = +25m.13s., PR₁N = +27m.38s., SR₁E = +27m.46s., MN = +56.2m. Belgrade ePE = +17m.5s., iPE = +18m.8s., PR₁N = +18m.21s., PR₁E = +19m.36s., PR₁N = +23m.24s., SR₁E = +25m.1s., SR₂E = 25m.35s., SR₃E = +27m.18s. Athens PR₁E = +18m.13s., eN = +18m.21s., i = +25m.27s. Lemberg ($\Delta = 103^{\circ}.7$) gives just 6h. Helwan PN = +19m.21s. River-view MN = +58.8m. Mizusawa PN = +19m.37s. Batavia i = +21m.38s.

Oct. 20d. 10h. 35m. 20s. Epicentre $0^{\circ}.5S. 152^{\circ}.0E.$ (as on 1918 May 20d.).

A = - .883, B = + .470, C = - .009; D = + .470, E = + .883;
G = + .008, H = - .004, K = -1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Riverview	33.3	181	e 6 53	- 6	(e 12 52)	+ 23	12.9	16.8
Sydney	33.3	181	10 58	?	13 28	+ 59	14.9	16.1
Manila	34.1	298	e 7 40	- 34	—	—	—	—
Adelaide	36.6	198	i 11 28	?	e 15 4	+ 106	—	18.7
Melbourne	37.9	190	—	—	(14 4)	+ 27	16.6	19.3
Taihoku	39.0	314	—	—	e 13 50	- 2	—	—
Zi-ka-wei	43.0	323	—	—	e 14 53	+ 5	—	—
Hong Kong	43.3	307	8 15	- 5	(14 40)	- 12	14.7	—
Batavia	45.4	262	e 8 39	+ 3	—	—	—	—
Wellington	45.7	155	—	—	e 14 22	- 62	e 19.6	22.7
Perth	46.4	225	—	—	18 5	?SR ₁	24.0	—
Victoria	86.9	42	—	—	—	—	39.2	47.5
Helwan	116.5	302	36 40	?SR ₁	—	—	—	—
Toronto	117.3	38	—	—	—	—	e 75.4	77.4
De Bilt	121.4	337	—	—	e 37 40	?SR ₁	e 62.7	67.0
Eskdalemuir	121.6	343	—	—	—	—	64.7	—
Uccle	122.7	336	—	—	—	—	e 61.7	72.7
Paris	125.0	335	—	—	—	—	e 65.7	77.7
Moncalieri	125.5	329	—	—	—	—	e 60.1	—

Additional readings and notes: Riverview gives eS = +10m.41s. and +11m.29s., MN = +18.9m., MZ = +21.7m. Melbourne gives S as SR₁, also eS = +11m.46s., SR₂? = +15m.34s. Hong Kong readings are given as at 11h. Perth PR₁ = +13m.6s., SR₁ = +20m.59s. Helwan PN = +35m.40s. De Bilt MN = +66.4m.

Oct. 20d. Readings also at 0h. (Hong Kong), 2h. (La Paz), 19h. (near Tokyo and Mizusawa), 23h. (Riverview).

Oct. 21d. 2h. 6m. 10s. Epicentre $41^{\circ}0'N$. $21^{\circ}5'E$. (as on 1921 Aug. 11d.).

A = +.702, B = +.277, C = +.656; D = +.366, E = -.930;
G = +.610, H = +.240, K = -.755.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3.3	150	0 44	- 8	1 18	-13	1.4	1.8
Mostar	3.6	313	0 31	-25	i 1 47	?L	(i 1.8)	2.1
Sarajevo	3.7	322	i 1 16	?S	(i 1 16)	-26	(2.3)	2.5
Belgrade	E. 3.9	349	e 1 6	+ 5	i 2 30	?L	(i 2.5)	3.9
	N. 3.9	349	e 1 5	+ 4	i 2 23	?L	(i 2.4)	3.0
Pompeii	5.3	270	2 17	?S	(2 17)	- 8	—	—
Rocca di Papa	6.7	280	e 1 32	-10	i 3 7	+ 5	—	5.3
Pola	6.8	307	e 2 0	+16	—	—	4.1	4.4
Vienna	8.1	335	2 11	+ 8	—	—	4.8	6.3
Padova	8.3	306	2 25	+19	5 16	?L	6.4	—
Lemberg	9.0	10	—	—	—	e 10.1	10.9	—
Moncalieri	10.8	296	—	—	4 54	+ 4	7.2	—
Zurich	11.2	309	e 2 54	+ 7	e 6 18	?L	(e 6.3)	—
Strasbourg	12.3	312	—	—	e 4 55	-31	e 7.0	—
Besançon	12.7	305	7 33	?L	—	—	(7.6)	7.8
Helwan	E. 13.7	141	8 50	?L	—	—	(8.8)	—
Hamburg	14.8	332	—	—	—	—	e 7.8	—
Uccle	15.4	316	—	—	e 6 44	+ 3	e 8.8	—
Paris	15.6	307	—	—	—	—	e 8.5	11.8
De Bilt	15.8	320	—	—	—	—	e 8.1	10.9
Kew	18.2	312	—	—	—	—	—	12.8
Eskdalemuir	21.7	320	—	—	—	—	13.8	—

Additional readings: Athens gives also MN = +1.9m. Mostar iP = 1m.1s., MN = +1m.9s. Sarajevo P = +2m.4s. Belgrade iPN = +1m.7s., and 1m.22s., iPE = +1m.14s. Rocca di Papa iP = +1m.40s. Pola MN = +4.8m. Padova SR₁E = +5m.25s., SR₁N = +6m.24s. Moncalieri eP = 2h.6m.3s. Helwan PN = +7m.50s. De Bilt MN = +10.8m.

Oct. 21d. 22h. 20m. 54s. Epicentre $46^{\circ}5'N$. $28^{\circ}3'W$. (as on 1918 Nov. 25d.).

A = +.606, B = -.326, C = +.725; D = -.474, E = -.880;
G = +.639, H = -.344, K = -.688.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Stonyhurst	18.0	56	e 9 6	?L	—	—	(e 9.1)	10.6
Edinburgh	18.2	50	—	—	—	—	—	10.1
Oxford	18.3	63	e 4 20	- 1	—	—	9.0	10.6
Paris	20.7	72	e 4 50	+ 1	—	—	—	10.1
Tortosa	21.5	95	5 1	+ 2	8 55	0	11.0	13.4
Uccle	21.8	67	e 5 2	- 1	e 8 57	- 4	e 10.1	—
De Bilt	22.3	63	—	—	e 9 12	+ 1	e 11.1	13.2
Marseilles	23.9	85	—	—	—	—	15.1	—
Strasbourg	24.2	72	e 5 28	- 2	—	—	e 12.1	—

De Bilt gives also MN = +12.4m.

Oct. 21d. Readings also at 3h. (near Lick), 16h. (Colombo).

Oct. 22d. 21h. 18m. 50s. Epicentre $34^{\circ}0'N$. $4^{\circ}0'E$.

A = +.827, B = +.058, C = +.559.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Algiers	2.9	i 0 46	+ 1	—	—	1.0	1.2
Granada	6.9	1 44	- 1	3 4	- 3	—	—
Tortosa	7.3	1 53	+ 2	—	—	—	6.8
Helwan	E. 23.5	19 10	?L	—	—	—	19.2

Helwan gives also PN = +16m.10s. The readings are probably of some other shock.

Oct. 22d. Readings also at 0h. (near Algiers), 2h. (Barcelona), 4h. (Vienna and Belgrade), 7h. (near Oaxaca), 21h. and 22h. (near Tacubaya), 23h. (near Ootomari).

Oct. 23d. 12h. 33m. 36s. Epicentre $37^{\circ}5'N$. $9^{\circ}0'W$.

A = -0.784 , B = -0.124 , C = $+0.609$; D = -0.156 , E = -0.988 ;
G = $+0.601$, H = -0.095 , K = -0.793 .

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
San Fernando	2.5	115	0 45	+ 6	1 41	+32	2.1	2.3
Coimbra	2.7	9	0 43	+ 1	1 15	+ 1	1.6	—
Granada	4.3	93	1 7	0	1 57	- 1	—	—
Tortosa	8.1	63	3 31	? 2	(3 31)	- 9	4.5	4.8
Barcelona	9.4	62	—	—	—	—	e 5.1	—

No additional readings.

Oct. 23d. Readings also at 3h. (near Zi-ka-wei), 4h. (La Paz and near Tokyo), 5h. (Helwan), 6h. and 11h. (Manila), 17h. (Tiflis (2)).

Oct. 24d. Readings at 0h. (Rio de Janeiro and Helwan), 2h. (Vienna, Riverview, and near Mizusawa), 4h. and 11h. (Taihoku), 13h. (Helwan), 14h. (near Athens), 23h. (Lick and near Batavia).

Oct. 25d. 0h. 47m. 30s. Epicentre $27^{\circ}0'S$. $72^{\circ}0'W$. (as on 1919 Feb. 20d.).

A = $+0.275$, B = -0.847 , C = -0.454 ; D = -0.951 , E = -0.309 ;
G = -0.140 , H = $+0.432$, K = -0.891 .

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz	11.1	19	e 2 44	- 2	—	—	5.4	7.5
Victoria	88.3	330	—	—	—	—	35.7	49.0
Stonyhurst	100.5	34	e 38 30	? L	—	—	(e 38.5)	60.5
Eskdalemuir	100.9	33	—	—	—	—	49.5	—
Edinburgh	101.2	32	—	—	—	—	54.5	—
Uccle	102.7	40	—	—	—	—	—	54.5
De Bilt	103.7	40	—	—	—	—	e 54.5	58.9
Hamburg	106.9	38	—	—	—	—	e 58.5	—
Helwan	113.8	67	27 30	? S	(27 30)	-30	—	—

De Bilt gives also MN = $+59.8m$.

Oct. 25d. 15h. 4m. 25s. Epicentre $37^{\circ}0'N$. $20^{\circ}5'E$. (as on 1920 June 12d.).

A = $+0.748$, B = $+0.280$, C = $+0.602$; D = $+0.350$, E = -0.937 ;
G = $+0.564$, H = $+0.211$, K = -0.799 .

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	2.8	69	e 0 43	- 1	1 15	- 2	1.3	1.6
Pompeii	5.9	311	e 2 57	? L	—	—	(e 3.0)	—
Sarajevo	7.0	348	e 1 28	-18	2 44	-26	—	3.3
Rocca di Papa	7.6	311	e 1 59	- 4	3 35	+ 9	—	—
Belgrade	7.8	0	e 1 16	-42	1 2 22	-69	—	2.4
Pola	9.2	330	2 35	+16	—	—	—	—
Budapest	10.5	355	—	—	e 4 20	-23	—	5.2
Vienna	11.6	346	e 3 9	+16	—	—	e 5.7	6.2
Helwan	11.6	125	11 35	?	—	—	—	—
Lemberg	13.1	10	—	—	e 5 23	-23	—	6.6
Strasbourg	14.9	326	—	—	e 6 23	- 7	—	—
Paris	17.6	318	e 4 5	- 7	—	—	e 8.6	8.6
Uccle	18.0	325	—	—	—	—	e 9.2	—
Hamburg	18.1	340	—	—	e 7 35	- 7	—	9.6

Additional readings and notes: Athens gives also ePN = $+0m.41s$. Rocca di Papa PR₁ = $+4m.17s$. Sarajevo P = $+1m.49s$. Belgrade eP = $+1m.44s$. These readings are given as 5hrs. Paris e has been increased by 10m. and entered as P.

Oct. 25d. 15h. 45m. 25s. Epicentre $7^{\circ}0'N$. $82^{\circ}5'W$. (as on 1921 Mar. 12d.).

$$A = +.130, B = -.984, C = +.122; \quad D = -.991, E = -.131; \\ G = +.016, H = -.121, K = -.992.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Balboa Heights	E.	3.5	55	1 3	+ 8	1 49	+12	2.4	2.9
	N.	3.5	55	1 2	+ 7	1 46	+ 9	2.3	2.4
Vera Cruz		18.0	314	4 22	+ 5	8 59	?L	10.7	12.5
Tacubaya		20.4	309	4 46	0	8 57	+25	11.0	12.2
La Paz		27.4	149	e 5 54	- 8	e 12 21	+93	15.0	19.4
Georgetown	E.	32.3	8	—	—	—	—	17.2	—
Chicago		35.1	353	14 55	?SR ₁	—	—	19.2	—
Toronto		36.7	4	—	—	—	—	e 19.4	21.6
Victoria		53.2	330	—	—	—	—	26.5	33.4
Uccle		82.6	40	—	—	e 22 35	-18	e 36.6	—
De Bilt	E.	83.0	40	—	—	—	—	e 38.6	44.5
	N.	83.0	40	—	—	—	—	e 36.6	45.1
Helwan	E.	106.8	56	64 35	?L	—	—	(64.6)	—

No additional readings.

Oct. 25d. Readings also at 0h. and 3h. (near Tokyo), 5h. (Perth), 15h. (near Tokyo and Mizusawa), 20h. (near Zurich), 21h. (La Paz, Helwan, and De Bilt), 22h. (Uccle).

Oct. 26d. 7h. 5m. 35s. (I) \dagger Epicentre $25^{\circ}0'N$. $68^{\circ}0'E$. (as on 1920 July 10d.).
23h. 2m. 40s. (II) \dagger

$$A = +.340, B = +.840, C = +.423; \quad D = +.927, E = -.375; \\ G = +.158, H = +.392, K = -.906.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
I Bombay		7.6	143	1 43	-12	3 6	-20	4.7	3.8
II		7.6	143	—	—	2 52	-34	—	3.9
I Simla		10.2	51	e 4 31	?S	(e 4 31)	- 4	e 5.4	—
II		10.2	51	e 4 20	?S	(e 4 20)	-15	e 5.2	—
I Kodaikanal		17.3	147	6 55	?S	(6 55)	-30	—	—
II		17.3	147	7 2	?S	(7 2)	-23	—	—
I Calcutta		18.8	94	7 31	?S	(7 31)	-27	9.2	—
II		18.8	94	8 14	?S	(8 14)	+16	9.7	—
I Colombo		21.4	146	9 13	?S	(9 13)	+20	11.4	13.8
II		21.4	146	9 20	?S	(9 20)	+27	11.8	12.5
I Taihoku		48.2	78	—	—	e 14 6	-110	—	—
II Hamburg		51.7	320	—	—	—	—	e 32.3	34.3
I De Bilt	E.	54.0	317	—	—	—	—	e 35.4	38.2
I	N.	54.0	317	—	—	—	—	e 35.4	36.8
II	E.	54.0	317	—	—	—	—	e 35.3	37.8
II	N.	54.0	317	—	—	—	—	e 33.3	36.7
I Kew		57.3	317	—	—	—	—	—	40.4
I Edinburgh		59.0	320	—	—	—	—	—	37.4
I Eskdalemuir		59.1	320	—	—	—	—	34.4	—

No additional readings.

Oct. 26d. Readings also at 0h. (De Bilt, Lick, Berkeley (2), and Victoria), 1h. and 2h. (Apia), 4h. (La Paz), 17h. (near Balboa Heights), 19h. (near Simla and near Vera Cruz and Tacubaya), 21h. (Apia).

Oct. 27d. Readings at 5h. (near Tacubaya), 6h. (Tiflis), 10h. (Azores), 19h. (Apia).

Oct. 28d. Readings at 4h. (Manila), 6h. (near Manila and near Tokyo), 7h. (Tiflis), 8h. (Azores), 13h. (Sydney).

Oct. 29d. Readings at 1h. (Taihoku and La Paz), 2h. (Mizusawa), 3h. (Rio de Janeiro), 4h. (Mizusawa), 10h. and 12h. (near Tacubaya), 22h. (Azores).

Oct. 30d. Readings at 6h. (La Paz), 7h. (Manila and Batavia and near Tacubaya), 9h. (near Port au Prince and Porto Rico and near Mizusawa), 22h. (La Paz).

Oct. 31d. Readings at 0h. (La Paz, Helwan, Uccle, and De Bilt), 4h. (Algiers), 9h. (near Mizusawa), 10h. (near Batavia), 16h. and 22h. (near Tokyo), 23h. (near Tacubaya, Vera Cruz, Colima, and near Tokyo).

Nov. 1d. Readings at 1h. (Helwan), 2h. and 3h. (near Colima), 8h. (Helwan), 15h. (Belgrade), 19h. (La Paz), 21h. (near Apia), 23h. (near Marseilles),

Nov. 2d. 3h. 38m. 0s. Epicentre $17^{\circ}0'N$. $99^{\circ}0'W$. (as on 1920 Oct. 1d.).

A = -0.150, B = -0.945, C = +0.292; D = -0.988, E = +0.156;
G = -0.046, H = -0.289, K = -0.956.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Oaxaca	2.1	90	0 0	-33	—	—	0.3	0.4
Puebla	2.2	20	1 6	?S	(1 6)	+ 6	1.7	1.9
Tacubaya	2.4	356	0 53	+16	—	—	1.4	2.2
Vera Cruz	3.5	51	1 3	+ 8	—	—	1.9	2.1
Mazatlan	9.3	313	—	—	—	—	—	4.3
Tucson N.	18.7	327	4 28	+ 3	8 5	+10	10.0	12.7
Chicago	26.7	19	5 40	-15	10 29	- 6	14.0	—
Ann Arbor N.	28.5	24	11 18	?S	(11 18)	+10	18.0	—
Lick N.	28.5	320	—	—	—	—	e 16.0	—
Georgetown	29.1	37	—	—	—	—	e 19.0	—
Berkeley	29.2	320	e 5 42	-38	—	—	e 14.5	16.3
Toronto	31.4	28	—	—	—	—	i 23.1	26.3
Victoria	37.2	333	—	—	—	—	17.2	24.0
La Paz	45.2	136	8 25	- 9	e 15 39	+21	22.4	25.0
Kew	82.1	39	51 0	?L	—	—	(51.0)	58.0
Paris	84.7	40	—	—	e 38 0	?L	48.0	—
Uccle	85.0	39	—	—	e 23 18	- 1	e 47.0	—
De Bilt	85.1	37	—	—	e 23 24	+ 4	e 44.0	—

Oaxaca readings are increased by 1min

Berkeley gives also eN = +17m.0s.

Nov. 2d. 7h. 56m. 40s. Epicentre $12^{\circ}0'S$. $78^{\circ}5'W$.

A = +0.195, B = -0.958, C = -0.208; D = -0.980, E = -0.199;
G = -0.041, H = +0.204, K = -0.978.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	11.0	115	2 44	0	(4 54)	0	4.9	5.3
Rio de Janeiro	35.3	113	e 9 26	?	—	—	17.3	—
Vera Cruz E.	35.7	331	—	—	—	—	22.3	22.8
Tacubaya	37.4	328	(6 45)	-48	(13 38)	+ 8	13.6	21.3?
Chicago	54.4	353	10 0	+25	17 5	- 9	25.5	—
Ithaca	54.5	3	—	—	—	—	34.8	—
Ann Arbor N.	54.5	357	25 20	?L	—	—	(25.3)	33.3
Toronto	55.6	359	—	—	e 18 38	+69	e 29.3	31.9
Victoria	72.2	331	—	—	20 7	-45	28.0	44.2
San Fernando	83.3	50	—	—	—	—	—	51.3
Rio Tinto	83.4	49	22 20	?S	(22 20)	-41	—	52.3
Honolulu E.	84.9	293	—	—	—	—	e 40.3	—
Tortosa	89.7	48	—	—	—	—	e 39.3	—

Continued on next page.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Algiers	90.6	52	e 17 59	?PR ₁	—	—	41.3	55.3
Barcelona	91.0	48	—	—	—	—	40.3	50.8
Eskdalemuir	91.7	34	—	—	i 24 43	+11	40.3	—
Kew	92.2	38	46 20	?L	—	—	(46.3)	58.3
Paris	93.2	40	e 22 20	?PR ₁	—	—	49.3	—
Marseilles	93.8	46	—	—	—	—	e 43.3	—
Wellington	94.2	226	—	—	e 24 2	-56	45.2	47.3
Uccle	94.8	39	e 18 20	?PR ₁	e 25 2	-2	e 40.3	—
Christchurch	95.0	224	24 20	?S	(24 20)	-46	52.3	66.3
De Bilt	E. 95.6	38	—	—	e 26 41	+89	e 42.3	51.7
N. 95.6	38	—	—	—	e 25 13	+1	e 41.3	44.6
Moncalieri	95.8	45	e 15 16	+88	26 27	+73	42.4	56.1
Pola	100.1	45	—	—	—	—	43.3	—
Riverview	114.2	224	—	—	e 35 20	?SR ₁	e 54.7	60.8
Sydney	114.2	224	28 26	?S	(28 26)	+22	57.1	60.1
Tiflis	122.6	47	e 15 8	-47	—	—	—	16.5
Kodaikanal	156.3	92	75 32	?L	—	—	(75.5)	—

Additional readings: Chicago PR₁ = +11m.57s. Toronto e = +24m.14s.,
eL = +43.9m. San Fernando MN = +48.3m. Honolulu eN =
+36m.20s. Eskdalemuir eE = +24m.20s. Wellington PR₁ = +16m.32s.,
eSR₁ = +31m.50s., eSR₂ = +37m.32s., L = +70.5m. Christchurch S =
+32m.8s. Moncalieri MN = +57.5m. Riverview MN = +61.1m.
Sydney L = +36.0m., P = +48m.32s. Tiflis e = +16m.8s.

Nov. 2d. Readings also at 0h. (Lick), 2h. (Tucson, Vera Cruz, Oaxaca (2), Puebla, Tacubaya (2), Mazatlan, and La Paz), 3h. (Victoria, Oaxaca, Tacubaya, and Vera Cruz), 7h. (Colombo and La Paz), 8h. (La Paz and Granada), 9h. (Kodaikanal), 12h. (Tacubaya), 15h. (Ottawa and Algiers), 16h. (Algiers and La Paz), 17h. (Helwan), 19h. (near Tokyo), 20h. (Apia, and Ottawa), 21h. (Riverview), 22h. (Helwan).

Nov. 3d. 17h. 13m. 36s. Epicentre 43° 0'N. 6° 5'W.

A = +.727, B = -.083, C = +.682; D = -.113, E = -.994;
G = +.678, H = -.077, K = -.731.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tortosa	5.7	110	1 28	0	—	—	3.2	3.9
Granada	6.2	158	1 37	+2	2 53	+4	—	—
Barcelona	6.6	101	—	—	e 3 31	+31	4.0	—
Besançon	9.8	59	4 12	?S	(4 12)	-11	—	—
Strasbourg	11.4	56	—	—	e 4 48	-16	—	—
Simla	65.1	70	e 20 0	?S	(e 20 0)	+34	—	—

No additional readings.

Nov. 3d. Readings also at 1h. (near Tacubaya), 3h. (Taihoku), 4h. (Hong Kong), 6h. (near Tacubaya, Vera Cruz, and Oaxaca), 7h. (Taihoku), 12h. (near Apia), 13h. (Helwan), 14h. (near Apia), 19h. (La Paz and Rio Tinto), 22h. (Rio Tinto), 23h. (Helwan).

Nov. 4d. Readings at 5h. (near Mizusawa), 11h. (Helwan).

Nov. 5d. Readings at 0h. (Zi-ka-wei), 5h. (Tokyo), 7h. (near La Paz), 12h. (Vienna), 14h. (Strasbourg), 20h. (Rio Tinto, Merida, and Vera Cruz), 21h. (Christchurch (2), Wellington, and Riverview), 22h. (Helwan, Mostar, and Tiflis), 23h. (Tiflis).

Nov. 6d. 16h. 54m. 50s. Epicentre $18^{\circ}0S$. $173^{\circ}0W$. (as on 1920 May 26d.).

$$A = -.944, B = -.116, C = -.309; \quad D = -.122, E = +.993; \\ G = +.307, H = +.038, K = -.951.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	4.3	17	1 20	+13	1 56	- 2	—	2.3
Wellington	25.5	202	—	—	—	—	e 13.4	14.2
Riverview	35.7	236	—	—	e 11 52	-74	e 16.2	19.8
Sydney	35.7	236	12 58	?S	(12 58)	- 8	19.3	23.7
Melbourne	41.6	233	—	—	e 14 58	+29	—	35.2
Honolulu	42.0	21	—	—	—	—	e 19.0	—
Victoria	79.8	31	—	—	(22 59)	+38	23.0	40.2
Hong Kong	81.8	297	—	—	—	—	42.2	—
La Paz	98.4	111	—	—	35 1	?SR ₁	49.4	51.0
Chicago	98.6	49	—	—	—	—	e 46.2	—
Eskdalemuir	141.8	9	—	—	—	—	69.2	—
De Bilt	E. 145.9	2	—	—	—	—	e 85.2	—
Kew	146.0	8	—	—	—	—	—	93.2
Uccle	147.1	4	—	—	—	—	e 75.2	—
Vienna	148.8	349	i 56 5	?L	—	—	(1 56.1)	—
Moncalieri	153.1	359	—	—	e 59 20	?	73.8	86.0
Helwan	E. 154.7	303	44 10	?SR ₁	—	—	—	—
Rio Tinto	156.9	28	84 10	?L	—	—	(84.2)	93.2

Additional readings: Apia gives also MZ = +3.3m. Riverview MN = +18.2m. Chicago L = +53.2m. De Bilt eLN = -88.2m.

Nov. 6d. Readings also at 4h. (near Mostar), 5h. (Riverview), 9h. (2) and 10h. (Christchurch), 14h. (Vera Cruz and Tacubaya), 15h. (Christchurch (2)), 17h. (near Tokyo), 19h. (Hong Kong and Zi-ka-wei).

1921. Nov. 7d. 15h. 59m. 40s. Epicentre $6^{\circ}5N$. $126^{\circ}0E$.

(as on 1921 Sept. 22d.).

$$A = -.584, B = +.804, C = +.113; \quad D = +.809, E = +.588; \\ G = -.066, H = +.092, K = -.994.$$

Several readings of S at European Stations are noteworthy.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	9.5	330	e 2 24	+ 1	4 50	+34	5.4	5.9
Taihoku	19.0	347	e 4 20	- 9	—	—	7.5	—
Hong Kong	19.5	326	4 26	- 9	—	—	7.9	9.7
Batavia	22.9	237	e 5 22	+ 6	i 9 38	+15	e 15.8	—
Zi-ka-wei	25.0	351	e 5 36	- 2	e 9 48	-15	—	12.4
Hukuoka	27.4	8	6 1	- 1	(11 31)	+43	11.5	—
Kobe	29.4	15	e 5 58	-24	e 9 33	?PR ₁	—	17.8
Osaka	29.5	16	6 35	+12	—	—	—	15.5
Tokyo	31.8	21	e 6 21	-24	—	—	—	—
Tyosi	32.3	23	e 6 32	-19	—	—	e 15.2	14.5
Mito	32.7	22	5 10	-104	—	—	13.1	16.1
Perth	39.6	194	—	—	13 54	- 6	23.5	—
Calcutta	39.7	299	7 50	- 2	17 14	?SR ₁	25.8	—
Colombo	45.9	273	12 20	?	17 20	+113	21.3	21.8
Riverview	46.8	151	e 8 38	- 8	e 15 26	-12	e 22.0	25.8
Sydney	46.9	151	8 32	-14	15 50	+10	24.8	26.4
Melbourne	47.7	160	e 11 8?	?PR ₁	i 16 20	+30	19.4	22.1
Kodaikanal	48.2	278	8 56	+ 1	(15 38)	-16	15.6	32.4
Bombay	53.2	289	17 33	?S	(17 33)	+34	—	30.8
Apia	65.0	109	—	—	—	—	30.3	—
Wellington	65.4	141	e 11 20	+33	19 56	+26	33.3	37.3
Honolulu	E. 74.7	69	11 52	+ 5	21 3	-19	34.6	34.8
Tiflis	79.1	313	—	—	e 23 20	+67	36.3	49.3
Helwan	E. 90.8	300	13 20	0	—	—	—	—
Belgrade	96.3	317	e 14 46	+55	e 24 1	-78	e 45.1	61.9
Budapest	96.4	319	e 3 50	?	e 18 20	?PR ₁	e 46.3	—
Vienna	97.9	320	—	—	—	—	e 47.3	59.6
Victoria	98.6	40	13 16	-47	21 9	?	31.0	51.1
Hamburg	99.7	327	e 18 20	?PR ₁	e 24 44	-69	46.3	60.1
Pola	100.7	319	24 20?	?S	(24 20?)	-102	e 52.3?	64.4
Strasbourg	102.4	321	e 13 20	-62	26 10	- 9	e 49.3	61.5

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa		102.6	315	e 22 14	?	25 14	-66	e 50.2	65.2
Berkeley	Z.	102.8	49	e 18 3	?PR ₁	—	—	e 47.1	48.7
De Bilt	E.	102.9	327	—	—	—	—	e 49.3	60.0
	N.	102.9	327	—	—	—	—	e 47.3	55.5
Dyce	N.	103.7	334	25 32	?S	(25 32)	-58	49.8	55.0
Uccle		104.0	326	—	—	—	—	e 48.3	61.2
Moncalieri		104.6	320	e 18 10	?PR ₁	27 47	+69	48.9	63.4
Besançon		104.8	321	12 49?	-104	26 27	-13	53.3	—
Edinburgh		105.0	333	—	—	e 42 20	?	45.3	65.8
Eskdalemuir		105.4	333	e 14 19	-17	e 26 5	-41	47.3	65.8
Kew		106.1	328	25 20	?S	(25 20)	-93	—	68.3
Paris		106.1	324	e 19 6	?PR ₁	e 26 37	-16	49.3	56.3
Oxford		106.4	328	—	—	28 27	+91	51.3	64.8
Marseilles	E.	106.9	320	—	—	—	—	e 49.3	—
Cape Town		108.1	235	25 11	?S	(25 11)	-120	—	—
Barcelona		109.9	319	—	—	e 34 44	?SR ₁	e 52.9	66.0
Tortosa		111.2	319	—	—	—	—	e 51.3	73.6
Algiers		111.4	313	—	—	—	—	e 57.3	72.3
Granada		115.9	316	19 34	?PR ₁	31 16	+179	—	—
San Fernando		118.0	318	21 8	?PR ₁	30 26	+112	—	76.3
Chicago		122.8	29	—	—	29 50	+40	36.8	—
Toronto		124.9	20	—	—	e 27 8	-137	e 64.6	92.8
La Paz		162.9	127	i 20 12	[+ 2]	34 50	?	74.5	82.4

Additional readings: Manila gives also MN = +5.6m. Batavia iP = +5m.24s., i = +5m.41s., and +12m.20s., e = +16m.31s. Zi-ka-wei iPSN = +10m.25s., MN = +15.0m. Kobe MN = +15.3m. Osaka MN = +14.0m. Perth PR₁ = +9m.43s. Riverview eP = +9m.1s., PS = +15m.42s., eSR₁ = +18m.38s. and +19m.2s., MZ = +28.5m., MN = +28.6m. Sydney SR₁ = +18m.50s. Wellington ePR₂ = +14m.44s., SR₁ = +24m.38s. Honolulu SN = +21m.8s. Tiflis MN = +41.3m. Belgrade PR₁ = +17m.49s., PR₂ = +19m.11s., SR₁ = +26m.5s., L = +57.8m. Hamburg MN = +57.6m., MZ = +58.7m. Pola eS = +35m.20s.? MN = +64.1m. Strasbourg MN = +56.8m. De Bilt ePR₁ = +18m.24s. Epicentre 6° 2'N. 127° 2'E. Dyce SN = +33m.32s. (SR₁). Uccle MN = +57.4m. Moncalieri MN = +66.8m. Eskdalemuir ePR₁N = +18m.37s., MN = +56.5m. Paris eSN = +26m.31s. San Fernando MN = +80.3m. Toronto e = +33m.26s. (SR₁), eL = +66.1m., +80.0m. and +90.8m., eL? = +100.6m. La Paz I. rep. = +98.5m.

Nov. 7d. Readings also at 3h. (Vera Cruz and near Tacubaya), 4h. (near Mizusawa), 5h. (Taihoku, Ottawa, and near Mizusawa), 6h. (Taihoku and near Mizusawa), 8h. (La Paz), 16h. (near Tokyo and Mizusawa (2)).

Nov. 8d. Readings at 0h. (Taihoku), 2h. (Belgrade), 4h. (Ottawa), 10h. (Manila), 11h. (Christchurch), 15h. (Batavia), 16h. (Dehra Dun and Adelaide).

Nov. 9d. Readings at 0h. and 1h. (Taihoku), 2h. (near Manila), 12h. (near Port au Prince), 14h. (near La Paz), 17h. (near Mizusawa), 18h. (Helwan), 23h. (near Mizusawa).

Nov. 10d. Readings at 0h. (La Paz), 7h. (near Port au Prince), 9h. (Vera Cruz and near Tacubaya), 16h. (Batavia), 19h. (De Bilt, Hamburg, Helwan, Tiflis, and near Mizusawa).

Nov. 11d. 1h. 18m. 45s. Epicentre 34° 2'N. 77° 5'E. (as on 1917 May 9d.).

A = +.179, B = +.808, C = +.562; D = +.976, E = -.216;
G = +.122, H = +.549, K = -.827.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Simla		3.1	185	e 0 45	-4	—	—	e 1.6	—
Dehra Dun		3.9	174	1 15	+14	—	—	—	—
Bombay		15.8	197	6 51	?S	(6 51)	+1	—	—
Colombo		27.4	175	14 33	?L	—	—	(14.6)	17.4
Helwan	E.	39.0	276	20 15	?L	—	—	(20.2)	—
Hamburg		50.2	316	—	—	—	—	e 20.2	30.2
De Bilt	N.	53.3	313	—	—	e 20 15	?SR ₁	e 27.2	29.5
Kew		56.7	314	—	—	—	—	—	39.2
Eskdalemuir		57.5	319	—	—	—	—	30.2	—

No additional readings.

Nov. 11d. 14h. 30m. 12s. Epicentre $51^{\circ}0'N$. $179^{\circ}5'W$. (as on 1920 Oct. 28d.).

A = -·629, B = -·005, C = +·777 ; D = -·009, E = +1·000 ;

G = -·777, H = -·007, K = -·629.

Very uncertain.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Honolulu	34·1	142	e 15 32	?L	—	—	18·6	18·8
Victoria	35·6	73	—	—	—	—	15·4	23·7
Berkeley	41·7	86	—	—	—	—	e 21·7	24·2
Chicago	60·0	60	10 18	+ 6	18 18	- 5	e 29·0	—
Toronto	62·8	53	—	—	—	—	e 34·3	—
Washington	67·5	56	—	—	—	—	e 41·8	—
De Bilt	76·8	357	—	—	e 27 18	?SR ₁	e 44·8	56·2
Moncalieri	83·8	355	e 18 13	?PR ₁	28 32	?SR ₁	40·3	—
Coimbra	88·4	7	—	—	—	—	e 29·8	—
Helwan	94·7	334	25 48	?S	(25 48)	+45	—	—

Additional readings: Honolulu gives also eN = +17m.50s., MN = +19·6m.

Berkeley eZ = +23m.11s. Chicago L = +34·0m. Toronto L = 36·5m.,

eL = +44·1m. De Bilt MN = +53·2m.

1921. Nov. 11d. 18h. 36m. 6s. Epicentre $8^{\circ}0'N$. $128^{\circ}0'E$.

(As on 1919 Mar. 21d.).

A = -·610, B = +·780, C = +·139 ; D = +·788, E = +·616 ;

G = -·086, H = +·110, K = -·990.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	9·5	314	e 2 27	+ 4	5 6	+50	5·8	—
Taihoku	18·1	341	4 20	+ 2	7 50	+ 8	10·4	15·3
Hong Kong	19·6	319	4 24	-12	(8 14)	- 1	8·2	10·4
Zi-ka-wei	24·0	346	5 19	- 9	e 9 43	- 1	e 11·6	14·0
Nagasaki	24·8	4	5 34	- 2	—	—	10·4	11·8
Batavia	25·5	237	e 5 40	- 3	e 9 32	-41	—	10·3
Hukuoka	25·7	5	5 51	+ 6	11 17	+61	19·4	24·6
Osaka	27·5	13	6 12	+ 9	11 29	+39	16·4	16·9
Kobe	27·5	13	5 59	- 4	10 47	- 3	14·7	14·6
Tokyo	29·7	20	6 27	+ 2	7 1	?	7·8	8·6
Tyosi	30·1	22	6 42	+13	13 53	?	23·8	23·2
Mito	30·6	20	6 31	- 3	—	—	13·7	23·9
Mizusawa	33·3	19	6 53	- 6	12 26	- 3	—	—
Hakodate	35·6	16	e 7 13	- 5	—	—	—	10·6
Ootomari	40·7	14	7 42	-19	(13 56)	-21	13·9	28·0
Calcutta	40·8	297	2 36	?	—	—	9·1	17·2
Perth	41·6	195	7 51	-17	9 55	?PR ₁	14·1	—
Adelaide	44·1	167	8 30	+ 3	i 14 36	-27	e 22·1	31·8
Riverview	47·2	154	e 8 42	- 6	i 15 30	-14	e 21·9	25·8
Sydney	47·2	154	9 0	+12	15 42	- 2	22·9	26·3
Colombo	47·8	271	9 6	+13	(15 54)	+ 3	15·9	17·4
Melbourne	48·4	161	9 30	+34	14 6	-113	17·0	35·2
Kodaikanal	49·9	277	(9 24)	+18	—	—	9·4	33·0
Dehra Dun	51·7	304	7 54	?	—	—	—	—
Bombay	54·5	288	9 40	+ 4	17 12	- 3	25·4	29·8
Apia	63·6	110	e 10 54?	+18	19 22	+14	30·9	36·9
Honolulu	E. 72·3	70	11 49	+17	21 16	+22	34·0	45·9
	N. 72·3	70	11 31	- 1	—	—	—	43·2
Tifis	79·7	311	e 11 54	-23	e 22 12	- 8	35·7	40·9
Sitka	E. 86·9	33	—	—	i 23 41	+ 1	42·4	44·6
Helwan	E. 91·7	301	13 30	+ 5	—	—	—	63·8
Lemberg	92·8	321	e 14 0	+29	24 42	- 1	e 50·2	61·5
Victoria	96·1	40	(12 55)	-55	(24 14)	-63	24·2	50·8
Athens	E. 96·1	310	e 14 0	+10	i 24 11	-66	e 38·9	56·7
	N. 96·1	310	—	—	e 24 6	-71	—	54·6
Budapest	96·6	320	e 13 27	-25	23 54	-88	e 43·9	—
Belgrade	96·8	318	e 13 48	- 5	i 24 27	-57	e 31·9	47·2
Vienna	98·0	321	13 42	-18	25 0	-36	e 44·4	49·4
Hamburg	99·4	328	e 13 58	- 9	i 24 40	-70	e 41·9	55·5
Berkeley	E. 100·3	49	14 17	+ 5	25 28	-31	47·5	52·3
Pola	100·9	318	e 14 4	-11	e 24 57	-67	e 43·0	64·1
Lick	N. 100·9	49	e 20 54	?PR ₁	—	—	—	50·9
Pompeii	E. 102·0	315	e 15 54	+94	24 54	-81	43·9	53·9
Padova	102·0	320	14 4	-16	24 55	-80	46·2	68·2
De Bilt	102·7	328	e 14 14	-10	e 24 54	-87	e 45·9	64·3

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	E.	102.9	316	i 14 21	- 4	i 24 56	-87	e 33.3	53.7
	N.	102.9	316	i 14 20	- 5	i 25 4	-79	e 34.7	55.1
Strasbourg		103.1	322	e 14 11	-15	e 26 7	-18	e 43.9	64.4
Zurich		103.1	321	e 14 10	-16	e 24 59	-86	—	—
Dyce		103.2	335	18 36	?PR ₁	24 46	-100	43.3	52.7
Uccle		103.8	327	e 14 14	-15	24 54	-97	42.9	65.2
Edinburgh		104.5	333	e 14 6?	-26	25 6	-92	42.9	66.4
Besançon		104.7	323	14 53?	+20	25 7	-92	50.9	—
Moncalieri		104.8	321	i 14 11	-22	27 58	+78	40.8	68.4
Eskdalemuir		104.9	333	—	—	23 54	-167	—	—
Kew		105.9	330	18 54	?PR ₁	—	—	—	68.9
Paris		105.9	325	e 18 55	?PR ₁	e 25 0	-111	46.9	55.9
Oxford	E.	106.2	330	18 46	?PR ₁	e 25 11	-103	34.4	71.1
Marseilles		107.1	320	e 19 6	?PR ₁	e 29 10	+128	e 48.9	52.8
Barcelona		110.1	319	e 19 7	?PR ₁	28 40	+71	e 46.7	54.1
Cape Town		110.6	236	18 10	[-14]	25 30	-123	—	26.1
Tortosa		111.4	320	19 24	?PR ₁	29 3	+82	42.4	63.4
Algiers		111.8	314	e 14 25	-41	25 31	-133	44.9	72.9
Granada		116.1	318	e 19 19	?PR ₁	i 30 7	+108	—	—
Coimbra		117.3	323	e 19 59	?PR ₁	29 44	+76	47.0	57.2
Rio Tinto		117.7	320	21 54	?PR ₁	—	—	—	78.9
San Fernando		118.3	319	18 36	[-12]	30 24	+108	—	81.0
Chicago		120.5	29	20 1	?PR ₁	29 51	+58	e 48.9	—
St. Louis	E.	121.4	33	i 19 42	?PR ₁	22 48	?	(77.6)	—
Ann Arbor	E.	122.0	25	20 36	?PR ₁	30 48	+104	46.9?	67.9
	N.	122.0	25	20 42	?PR ₁	30 54	+110	—	67.9
Toronto		122.7	21	14 12	-104	i 23 30	?PR ₁	e 62.9	91.7
Northfield		124.6	15	—	—	e 37 54	?SR ₁	79.9	—
Ithaca		124.8	20	e 20 42	?PR ₁	—	—	68.9	—
Georgetown	N.	127.6	22	19 19	[+ 6]	30 26	+42	66.3	—
Washington		127.6	22	19 27	[+14]	—	—	63.9	—
Cheltenham	N.	127.8	22	—	—	31 21	+95	58.0	92.5
Vera Cruz		128.7	55	19 41	[+26]	—	—	—	—
Port au Prince		146.7	35	e 18 16	[-95]	—	—	—	—
Porto Rico	E.	150.7	27	—	—	e 48 54	?SR ₁	e 82.2	99.0
La Paz		162.1	120	i 20 19	[+10]	34 37	?	72.5	98.1

Additional readings: Zi-ka-wei gives also iPSN = +10m.11s., PSE = +10m.18s., MN = +15.7m. Batavia iS = +5m.43s., i = +6m.38s., and +10m.4s. Osaka MN = +19.8m. Kobe MN = +20.0m. Tokyo MN = +8.8m. Tyosi MN = +24.4m. Mito MN = +17.8m. Mizusawa PN = +6m.50s. Hakodate MN = +9.0m. Adelaide iPR₁ = +10m.6s., i = +11m.18s., e = +16m.54s. Riverview eP = +9m.10s., PS = +15m.42s., and +16m.19s., iSR₁ = +18m.57s., and +19m.5s., SR₂ = +20m.14s., MZ = +34.9m., MN = +35.4m. Sydney SR₁ = +18m.54s. Colombo S = +11m.6s. (?PR₁). Melbourne SR₁ = +15m.0s. Apia e = +11m.4s. and +11m.26s., PR₁ = +13m.54s., and +16m.9s., MN = +33.9m., T₀ = 18h.36m.44s. Epicentre 1°58. 128°0E. Tiflis e = +34m.54s. Sitka eN = +24m.7s. Victoria SV = +13m.54s., MV = +41.4m. Athens PR₁ = +17m.36s. Belgrade iP = +13m.55s., PR₁N = +17m.14s. Vienna PR₁N = +17m.48s., PR₂E = +20m.16s., PR₂N = +20m.17s., SN = +25m.9s., MZ = +65.4m. Hamburg MN = +50.0m., MZ = +62.8m. Berkeley iE = +24m.48s. Pola MN = +61.6m. De Bilt ePR₁ = +18m.26s., MN = +55.8m., T₀ = 18h.35m.54s. Strasbourg MN = +56.1m., MZ = +65.4m. Rocca di Papa ePE = +14m.6s., iPN = +17m.30s., eLE = +38.1m. Dyce SE = +24m.56s. Uccle P = +14m.22s., PR₁ = +18m.30s., MN = +49.9m., MZ = +65.4m. Edinburgh PR₁ = +19m.3s. Moncalieri MN = +69.4m. Barcelona PR₁ = +25m.29s., MN = +69.4m. Algiers PR₁ = +19m.20s., L = +47.9m. Granada gives its readings as on 12d. San Fernando MN = +79.1m. St. Louis gives L as P of a following shock. Toronto PR₁? = +13m.42s., eL = +49.3m., L = +60.8m. Ithaca eE = +31m.54s., eN = +36m.54s., eE = +37m.54s., eLE = +53.9m., e = +80m.12s. Georgetown eE = +19m.24s., eLE = +51.6m., eLN = +50.5m., LE = +65.4m. Washington L = +75.9m. Cheltenham PR₁N = +21m.33s., eE = +39m.14s. and +44m.3s., ME = +84.6m. La Paz iS = +35m.0s., L? = +66.3m., MN = +89.5m., L (rep.) = +92.2m.

Nov. 11d. Readings also at 2h. (La Paz), 6h. (Manila), 7h. (De Bilt), 16h. (Manila and near Athens), 18h. (Manila), 19h. (Georgetown).

Nov. 12d. Readings at 3h. and 6h. (Ottawa), 12h. (near Nagasaki), 15h. (Sara-jevo), 16h. (La Paz), 17h. (La Paz and Colombo), 19h., 20h., and 21h. (La Paz), 23h. (near Batavia).

Nov. 13d. 8h. 40m. 45s. Epicentre $10^{\circ}5'N. 71^{\circ}0'W.$

A = +.320, B = -.930, C = +.182; D = -.946, E = -.326.

G = +.059, H = -.172, K = -.983.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Port au Prince	N.E.	8.2	351	2 10	- 6	3 31	-11	4.8	4.0
	N.W.	8.2	351	—	—	3 30	-12	3.8	7.3
Balboa Heights	E.	8.5	261	2 15	+ 6	3 51	+ 1	5.5	5.9
	N.	8.5	261	2 13	+ 4	3 49	- 1	5.4	6.2
Porto Rico	E.	9.4	35	e 5 17	?L	—	—	8.0	8.6
	N.	9.4	35	e 5 30	?L	—	—	8.2	8.3
Vera Cruz		25.8	293	5 58	+12	—	—	16.5	21.2
La Paz		27.1	174	i 5 55	- 4	i 10 53	+10	13.7	18.4
Tacubaya		28.6	292	6 5	- 9	—	—	17.7	19.7
Cheltenham	E.	28.7	350	—	—	11 30	+18	14.2	14.9
	N.	28.7	350	6 51	+36	11 10	- 2	13.1	13.4
Washington		28.9	350	5 58	-19	11 45	+30	16.6	—
St. Louis	E.	33.0	332	e 7 57	+61	e 12 33	+ 9	14.2	18.0
Ann Arbor	N.	33.7	346	8 15	+73	(12 45)	+ 9	12.8	—
Toronto		34.0	350	—	—	—	—	e 17.0	20.6
Chicago		34.5	339	6 5	-64	12 0	-48	e 15.8	—
Rio de Janeiro	N.	43.1	140	—	—	e 22 39	?L	24.4	—
Berkeley		53.3	310	—	—	—	—	31.5	34.9
Victoria		57.7	322	17 46	?S	(17 46)	- 9	30.1	40.9
Granada		65.7	54	i 10 54	+ 5	—	—	—	—
Eskdalemuir		68.8	35	—	—	—	—	31.2	39.2
Edinburgh		69.0	35	—	—	—	—	—	44.2
Oxford		69.3	39	—	—	—	—	—	35.2
Paris		71.3	41	—	—	—	—	33.2	—
De Bilt		73.2	39	—	—	e 21 16	+12	e 33.2	38.0
Moncalieri		74.7	46	e 15 36	?PR ₁	25 36	?SR ₁	36.8	—
Strasbourg		74.8	42	11 39	- 9	e 12 15	?	—	—
Hamburg		76.3	37	i 11 46	-11	—	—	e 38.2	46.2
Pola		79.0	45	—	—	21 48	-24	—	—

Additional readings: La Paz gives also $i = +11m.27s.$ St. Louis MN =
+19.8m. Ann Arbor LE = +12.2m. Toronto $iL = +15.6m., eL =$
+19.6m. Victoria $L? = +21m.43s., ?SR_1.$ De Bilt MN = +34.3m.

Nov. 13d. 13h. 51m. 15s. Epicentre $20^{\circ}5'N. 141^{\circ}5'E.$

A = -.733, B = +.583, C = +.350; D = +.622, E = +.783;

G = -.274, H = +.218, K = -.937.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Osaka		15.2	340	3 53	+11	(6 46)	+ 9	6.8	8.1
Tyosi		15.2	358	3 37	- 5	6 16	-21	—	—
Kobe		15.3	340	3 52	+ 9	(6 54)	+15	6.9	7.0
Tokyo		15.3	355	i 3 42	- 1	4 43	?	6.2	6.4
Mito		15.9	357	3 45	- 6	(6 45)	- 8	6.8	7.0
Nagasaki		16.1	322	4 7	+14	—	—	7.5	7.5
Hukuoka	N.	16.4	325	4 14	+17	(7 36)	+32	7.6	7.7
Mizusawa	E.	18.6	359	4 16	- 8	7 37	-16	—	—
	N.	18.6	359	4 17	- 7	7 36	-17	—	—
Taihoku		18.9	288	e 4 54	+26	—	—	9.0	—
Manila		20.4	257	e 5 19	+33	—	—	—	—
Zi-ka-wei		21.0	305	i 4 42	-11	e 8 10	-34	—	10.1
Hong Kong		25.5	279	5 48	+ 5	—	—	—	14.2
Ootomari		26.2	2	5 23	-27	—	—	9.6	—
Batavia		43.2	235	8 18	- 2	14 52	+ 1	—	—
Sydney		55.1	170	16 45	?S	(16 45)	-37	—	30.8
Riverview		55.1	170	e 10 8	+28	e 17 21	- 1	e 23.0	32.4
Honolulu		56.1	78	—	—	e 16 40	-55	20.8	—
Melbourne		58.4	177	—	—	e 17 33	-31	—	18.6
Hamburg		95.0	334	i 17 17	?PR ₁	—	—	e 50.8	—
Helwan	E.	96.1	306	23 45	?S	(23 45)	-92	—	—
De Bilt		98.1	334	—	—	e 24 57	-40	e 46.8	49.6
Eskdalemuir		98.5	341	—	—	i 24 53	-48	46.8	—
Uccle		99.4	334	—	—	—	—	e 46.8	—

Additional readings: Osaka gives also MN = +6.9m. Batavia $iP =$
+8m.19s., $i = +15m.47s.$ Riverview MN = +29.6m. De Bilt MN =
+57.8m. Eskdalemuir $e = +31m.38s.$

Nov. 13d. Readings also at 0h. (Riverview), 9h. (Batavia), 11h. (Tacubaya), 12h. (Batavia), 15h. (La Paz (2)), 16h. (Manila), 18h. (Batavia and Riverview), 20h. (Ottawa), 23h. (La Paz and Christchurch).

Nov. 14d. 6h. 51m. 40s. Epicentre $18^{\circ}0'S$. $173^{\circ}5'E$. (as on 1921 Oct. 18d.).

A = -0.945, B = +0.108, C = -0.309; D = +0.113, E = +0.994;
G = +0.307, H = -0.035, K = -0.951.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	14.8	76	e 4 55	+79	e 5 58	-29	8.9	—
Riverview	25.5	227	e 5 45	+ 2	e 10 14	+ 1	e 12.5	14.2
Christchurch	25.6	181	5 38	-6	11 2	+48	14.5	17.1
Melbourne	31.8	227	e 8 20	?PR ₁	—	—	—	18.1
Adelaide	35.3	234	—	—	—	—	—	20.8
Honolulu	E. 48.3	39	16 32	?S	(16 32)	+34	22.3	24.8
	N. 48.3	39	16 20	?S	(16 20)	+22	22.5	25.2
Perth	53.5	243	—	—	—	—	21.3	—
Batavia	65.9	273	e 10 50	0	18 50	-46	—	—
Berkeley	82.1	46	—	—	—	e 38.9	—	—
Victoria	87.0	37	—	—	(24 31)	+50	24.5	44.3
Kodaikanal	98.9	279	58 56	?L	—	—	(58.9)	—
Chicago	108.4	51	19 1	?PR ₁	28 50	+96	e 44.8	—
Toronto	114.6	49	—	—	—	—	e 63.2	70.8
De Bilt	144.7	348	—	—	—	—	e 81.3	—

Additional readings: Apia gives also another reading at +10m.50s. River-
view eS = +10m.46s., MN = +13.6m. Honolulu S = +20m.10s.
Batavia i = +12m.12s.

Nov. 14d. Readings also at 1h. (La Paz), 7h. (Zi-ka-wei, Manila, and Batavia), 8h. (La Paz, Christchurch, and near Tokyo), 12h. (Riverview and near Mizusawa), 15h. (Riverview), 16h. (La Paz), 18h. (near Osaka).

Nov. 15d. 4h. 50m. 3s. Epicentre $35^{\circ}3'N$. $130^{\circ}8'E$.

A = -0.533, B = +0.618, C = +0.578.

	Δ	P.	O-C.	S.	O-C.	L.	ME	MN
	°	m. s.	s.	m. s.	s.	m.	m.	m.
Hukuoka	1.7	0 7	-19	—	—	0.5	—	0.9
Nagasaki	2.7	0 39	-3	—	—	1.4	—	—
Kobe	3.6	i 0 56	0	(1 39)	0	1.6	2.7	1.9
Osaka	3.9	1 2	+1	(1 50)	+3	1.8	3.7	4.7
Kyoto	4.1	e 1 3	-1	—	—	2.1	2.3	2.1
Zi-ka-wei	8.8	—	—	e 3 59	+1	—	—	—

No additional readings.

1921. Nov. 15d. 20h. 36m. 30s. Epicentre $36^{\circ}5'N$. $70^{\circ}5'E$.

A = +0.268, B = +0.758, C = +0.595; D = +0.943, E = -0.334;
G = +0.199, H = +0.561, K = -0.804.

A depth 0.030 of focus is assumed.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.	m.
Simla	-0.2	7.7	132	i 1 48	-6	i 2 36	-48	i 3.1	3.1
Dehra Dun	-0.3	8.8	133	2 30	+21	—	—	—	—
Bombay	-1.0	17.7	173	3 56	-5	7 6	-5	—	7.3
Tiflis	-1.2	20.6	293	5 54	+80	i 9 42	+66	15.5	—
Calcutta	-1.2	20.8	127	4 54	+18	(8 36)	+21	8.6	—
Kodaikanal	-1.8	27.0	165	5 54	+14	—	—	8.9	15.1
Colombo	-2.0	30.8	164	7 0	+44	11 0	-13	12.9	20.5
Helwan	-2.2	33.2	270	8 28	-10	11 38	-13	—	—
E. -2.2	33.2	270	6 48	+10	—	—	—	—	23.8
Lemberg	-2.3	35.7	308	i 6 50	-10	i 12 13	-17	e 19.0	19.7
Belgrade	-2.4	38.3	301	i 7 15	-6	i 12 56	-13	e 23.4	30.5
Hong Kong	-2.5	40.2	100	7 27	-9	(13 17)	-17	—	—

Continued on next page.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	°	m. s.	s.	m. s.	s.	m.	m.
Mostar	-2.5	40.3	298	i 7 19	-17	i 12 56	-39	e 13.3	16.9
Vienna	-2.5	40.8	307	i 7 35	-5	(i 13 36)	-6	i 13.6	17.9
Zi-ka-wei	-2.6	42.1	84	i 7 42	-9	(e 13 48)	-11	16.8	17.6
Pola	-2.7	42.9	300	i 8 0	+3	i 14 8	-2	i 17.5	17.9
Pompeii	-2.7	43.2	293	8 10	+11	14 24	+10	51.5	—
Padova	-2.8	44.2	302	8 1	-5	14 26	-1	—	—
Rocca di Papa	-2.8	44.3	296	i 8 6	-1	i 14 19	-9	e 27.3	—
Hamburg	-2.8	44.5	315	i 8 5	-4	i 14 26	-5	e 15.4	18.4
Taihoku	-2.8	44.8	91	8 5	-6	—	—	—	—
Zurich	-2.9	46.1	305	i 8 15	-5	i 14 46	-5	i 17.7	—
Strasbourg	-2.9	46.5	309	i 8 18	-5	i 14 54	-2	e 18.5	20.9
Moncalieri	-2.9	47.1	302	i 8 17	-10	i 14 59	-6	22.5	32.1
De Bilt	-3.0	47.6	312	i 8 28	-2	i 15 9	-1	e 19.0	19.6
Besançon	-3.0	47.8	305	8 30	-2	15 11	-1	21.5	—
Uccle	-3.0	48.2	310	i 8 33	-1	i 15 18	0	i 20.1	—
Nagasaki	-3.0	48.2	78	8 29	-5	—	—	—	—
Hukuoka	-3.0	48.3	76	8 32	-3	15 25	+6	19.4	20.5
Marseilles	-3.1	49.2	300	8 50	-9	i 15 39	+10	e 20.5	—
Manila	-3.1	49.8	103	e 8 34	-11	—	—	—	—
Paris	-3.1	49.8	309	i 8 45	0	i 15 36	-1	19.5	19.5
Dyce	-3.2	51.0	320	8 53	0	(15 53)	+2	15.9	21.6
Kew	-3.2	51.0	312	8 30	-23	—	—	—	35.5
Oxford	-3.2	51.5	313	8 53	-3	16 0	+2	19.7	28.9
Kobe	-3.2	51.5	74	8 54	-2	—	—	—	18.3
Osaka	-3.2	51.8	74	9 0	+2	17 24	-83	25.1	30.0
Edinburgh	-3.2	51.8	318	i 8 57	-1	i 16 7	+6	—	21.2
Eskdalemuir	-3.2	51.9	318	i 9 1	+3	i 16 9	+7	21.5	27.1
Barcelona	-3.2	52.0	299	i 9 3	+4	i 16 9	+5	e 21.9	—
Algiers	-3.3	52.9	292	i 9 6	+2	i 16 17	+3	21.5	23.2
Ootomari	-3.3	53.0	57	9 11	+1	—	—	—	—
Hakodate	-3.3	53.2	62	9 3	-3	—	—	—	9.2
Tortosa	-3.3	53.4	299	i 9 12	+4	i 16 21	+1	22.0	22.7
Mizusawa	-3.4	54.4	66	9 16	+3	16 33	-2	—	—
Batavia	-3.4	54.6	135	i 9 14	0	—	—	e 19.5	—
Tokyo	-3.4	54.7	70	i 9 12	-3	—	—	—	11.1
Tyosi	-3.4	55.5	68	9 22	+1	17 11	+26	—	—
Granada	-3.5	57.6	295	i 9 42	+8	i 17 25	+15	—	—
Rio Tinto	-3.6	59.6	298	10 30	+44	—	—	—	23.5
Coimbra	-3.6	59.9	300	i 9 55	+7	i 17 57	+19	i 28.2	—
San Fernando	-3.6	59.9	296	10 4	+16	17 42	+4	—	39.3
Perth	-4.0	80.5	143	11 40	-18	—	—	—	—
Cape Town	-4.1	85.5	221	12 25	-2	21 52	-47	22.6	22.8
Ottawa	-4.3	92.7	338	13 0	-7	23 11	-45	43.5	—
Victoria	-4.3	94.3	10	14 23	+67	23 15	-59	e 44.0	45.7
Toronto	-4.3	95.3	340	—	—	23 30	-54	i 43.2	46.4
Ithaca	-4.3	95.5	337	e 13 0	-22	i 23 23	-63	e 47.5	—
Ann Arbor	-4.4	97.8	342	13 18	-16	23 30	-79	39.5	49.5
Georgetown	-4.4	98.9	336	e 13 30	-11	23 44	-77	44.8	—
	-4.4	98.9	336	e 13 30	-11	i 23 45	-76	65.8	—
	-4.4	98.9	336	e 13 30	-11	23 30	-91	49.5	—
Washington	-4.4	98.9	336	14 27	+46	23 44	-77	40.5	—
Cheltenham	-4.4	99.0	336	13 20	-21	—	—	27.2	27.3
Chicago	-4.4	99.2	345	13 28	-14	23 39	-85	e 41.0	—
Melbourne	-4.4	101.2	130	18 30	? PR ₁	—	—	30.7	61.1
St. Louis	-4.5	102.8	346	e 16 24	?	i 24 11	-93	32.2	46.3
Riverview	-4.5	102.9	124	e 17 37	? PR ₁	e 24 2	-98	e 33.9	63.2
Sydney	-4.5	102.9	124	12 30	-92	—	—	—	33.0
Berkeley	-4.5	104.8	10	e 14 25	+13	25 58	-1	e 45.9	—
	-4.5	104.8	10	13 57	-15	25 51	-8	—	—
Honolulu	-4.5	106.2	47	18 17	? PR ₁	28 21	?	44.6	45.5
Tucson	-	111.2	1	18 56	? PR ₁	23 52	?	28.4	28.5
La Paz	-	138.4	290	19 10	[-27]	—	—	67.5	81.0

Additional readings and notes: Tiflis gives also $e = +6m.59s.$ and $+9m.31s.$ Helwan gives Milne-Shaw readings (recorded in the first line) also $PR_1 = +7m.20s.$ Belgrade $PR_1N = +8m.2s., PR_1E = +9m.3s., PR_2E = +10m.2s., PR_2N = +10m.4s., PR_2E = +11m.10s., PR_3N = +11m.12s., PR_3E = +14m.51s., SR_1N = +14m.53s., SR_2E = +16m.56s., SR_2N = +16m.57s., SR_3E = +17m.33s., SR_3N = 17m.35s.$ Hong Kong S is recorded as PR_1 . Mostar $PR_1 = +8m.6s., SR_1 = +13m.12s.$ Vienna $iZ = +7m.37s., iE = +7m.38s.$ Zi-ka-wei $PME = +9m.38s., eS = +13m.18s., PSE = +13m.48s., PSN = +13m.49s.,$ this is taken to be S in the table, $SR_1V = +15m.20s., MN = +17.4m.$ Pola $MN = +17.6m.$ Padova $PR_1 = +8m.9s.$ Hamburg $PR_2 = +10m.25s., MZ = +19.2m., MN = +19.3m.$

Notes continued on next page.

Strasbourg iPE = +8m.18s., iPN = +8m.21s., PR₁V = +10m.13s., PR₁E = +12m.18s., MN = +21.0m. Moncalieri MN = +35.2m. De Bilt MN = +26.3m. Uccle PR₁ = +10m.28s., i = +16m.36s., +17m.59s., +19m.32s., and +20m.4s. (taken as iL). Epicentre 40°·5N. 69°·9E. Marseilles PR₁ = +10m.51s., SR₁ = +13m.17s. Paris SR₁ = +18m.8s., MN = +21.5m. Dyce iE = +10m.55s. and +11m.53s., iN = +13m.23s., MN = +21.0m. Kobe readings have been increased by 10min. Osaka MN = +31.6m. Edinburgh PR₁ = +11m.2s. Eskdalemuir PR₁ = +11m.3s., T₀ = 20h.36m.33s. Barcelona PR₁? = +9m.51s., PR₁ = +11m.3s., ? = +17m.34s., SR₁ = +18m.27s. Mizusawa SN = +16m.35s. Batavia i = +16m.1s., +17m.21s., and +17m.45s. Coimbra i = +19m.24s., +25m.45s., +28m.12s. (taken as L in the table), and +33m.18s., T₀ = 20h.36m.26s. San Fernando MN = +38.9m. Ottawa PR₁ = +16m.32s., PR₂ = 18m.42s., SR₁ = +29m.23s., SR₂ = +33m.2s., eL = +41.5m. T₀ = 20h.37m.17s. Victoria iSR₁? = +24m.57s. Toronto iSR₁ = +26m.0s., iSR₂ = +31m.18s., e = +36m.30s., iSR₃? = +38m.30s., eL = +54.5m. Ithaca PR₁ = +17m.4s., eN = +19m.0s. Ann Arbor SE = +23m.36s., ME = +43.5m., T₀ = 20h.37m.36s.? Georgetown iEN = +19m.41s., iZ = +19m.30s. (?PR₁). Washington PR₁ = +17m.30s., PR₂ = +20m.38s., L = +50.5m. Cheltenham eN = +16m.30s. and +22m.34s., LE = +26.1m., LN = +23.6m. Chicago PR₁ = +17m.30s., PR₂ = +19m.35s., L = +63.5m. Melbourne SR₁ = -23m.36s., SR₂ = +25m.48s., SR₃ = +27m.54s. St. Louis MN = +47.0m. Riverview e(SR₁) = +26m.39s., e = +32m.27s., and +32m.39s., MN = +62.4m. Berkeley PR₁E = +18m.13s., PR₁Z = +18m.26s. Epicentre 40°·0N. 70°·0E. La Paz iP = +19m.17s.

Nov. 15d. Readings also at 2h. (Zi-ka-wei, Batavia, and Manila), 3h. (Helwan and De Bilt), 4h. (La Paz), 6h. (Helwan), 8h. (Georgetown and Nagasaki), 11h. (La Paz), 13h. (Nagasaki, Zi-ka-wei, and near Osaka), 17h. (near Tokyo), 18h. (La Paz), 19h. (Helwan), 20h. (Vera Cruz and Tacubaya), 21h. (La Paz).

Nov. 16d. 13h. 53m. 2s. Epicentre 35°·3N. 130°·8E. (as on Nov. 15d.).

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Nagasaki	2.7	0 42	0	—	—	—	—
Kobe	3.6	2 17	?L	—	—	(2.3)	—
Osaka	3.9	1 46	?S	(1 46)	- 1	2.6	3.9
Zi-ka-wei	8.8	e 1 54	-19	—	—	—	—

Nov. 16d. 14h. 38m. 50s. Epicentre 3°·0N. 122°·0E. (as on 1920 May 19d.).

A = -·529, B = +·847, C = +·052; D = +·848, E = +·530;
G = -·028, H = +·044, K = -·999.

Very doubtful.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Manila	11.3	5	—	—	e 4 16	-46	7.4	—
Batavia	17.7	239	—	—	e 6 30	-63	—	—
Hong Kong	20.8	339	4 56	+ 5	—	—	(9.3)	—
Zi-ka-wei	28.0	2	6 30	+22	e 11 0	+ 1	—	27.2
Melbourne	46.0	152	—	—	e 17 10	?	—	34.1
Riverview	46.0	146	—	—	e 15 4	-24	e 26.6	31.1
Sydney	46.0	146	16 40	?S	(16 40)	+72	26.6	30.3
Helwan	N. 89.0	300	25 10	?S	(25 10)	+67	—	—
De Bilt	103.7	325	—	—	—	—	e 56.2	—
Uccle	104.6	324	—	—	—	—	e 55.2	—

Additional readings and notes : Hong Kong gives L as alternative P. Zi-ka-wei gives also eP = +7m.4s. Riverview S given as e, also eS = +19m.43s., PS = +20m.0s., MN = +30.4m.

Nov. 16d. Readings also at 4h. (La Paz, Batavia, and near Manila), 5h. (Helwan), 7h. (Tortosa), 9h. (Batavia), 15h. (La Paz (2), and Kodaikanal), 18h. (La Paz).

Nov. 17d. 7h. 51m. 25s. Epicentre $11^{\circ}0'N$, $127^{\circ}0'E$. (as on 1921 Sept. 28d.).

A = -·591, B = +·784, C = +·191; D = +·799, E = +·602;
G = -·115, H = +·152, K = -·982.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	6·9	303	e 1 21	-24	3 39	+32	4·3	4·8
Taihoku	14·9	341	—	—	e 6 40	+10	—	—
Hong Kong	16·7	315	3 52	-9	6 55	-16	9·0	—
Zi-ka-wei	20·8	347	e 4 49	-2	e 8 37	-3	—	—
Batavia	26·4	230	i 6 14	+22	i 8 39	-111	—	—
Kodaikanal	48·7	275	26 41	?L	—	—	(26·7)	—
Riverview	50·4	153	e 10 52	+103	e 17 45	-81	e 23·8	30·3
Sydney	50·4	153	14 5	?	—	—	—	—
Helwan	E. 89·4	301	22 35	?S	(22 35)	-92	—	—
Victoria	94·4	40	—	—	—	—	43·8	51·7
De Bilt	99·6	329	—	—	—	—	e 52·6	56·9
Uccle	100·8	327	—	—	—	—	e 51·6	—
La Paz	164·3	112	19 16	[-55]	—	—	25·9	—

Additional readings: Manila gives also MN = +5·6m. Batavia P = +4m.12s.,
the readings entered being i's. Riverview MN = +30·7m. De Bilt
MN = +54·8m.

Nov. 17d. 22h. 12m. 30s. Epicentre $36^{\circ}5'N$, $118^{\circ}0'W$. (as on 1915 Oct. 3d.).

A = -·377, B = -·710, C = +·595; D = -·883, E = +·470;
G = -·279, H = -·525, K = -·804.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Lick	3·0	287	i 0 46	-1	i 1 23	0	—	1·5
Berkeley	E. 3·7	294	e 0 59	+1	e 1 44	+2	e 1·8	2·0
	N. 3·7	294	e 1 0	+2	e 1 43	+1	e 1·9	2·2
Tucson	N. 7·3	123	—	—	e 3 7	-11	—	3·7

Berkeley gives also iPN = +1m.9s.

Nov. 17d. Readings also at 4h. and 5h. (Manila), 7h. (Taihoku), 18h. (Barcelona and near Tortosa), 22h. (near Mizusawa and Tokyo).

Nov. 18d. 2h. 33m. 36s. Epicentre $11^{\circ}0'N$, $127^{\circ}0'E$. (as on Nov. 17d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	6·9	303	e 1 41	-4	—	—	4·7	—
Zi-ka-wei	20·8	347	e 4 51	0	e 8 51	+11	—	—
Kodaikanal	48·7	275	30 18	?	—	—	—	—
Riverview	50·4	153	—	—	18 18	+114	e 31·5	35·4
Helwan	E. 89·4	301	57 24	?L	—	—	(57·4)	—
De Bilt	N. 99·6	329	—	—	—	—	e 53·4	56·8
Uccle	100·8	327	—	—	—	—	e 53·4	—

Helwan reading is increased by 1h. De Bilt gives also eLE = +54·4m.

Nov. 18d. Readings also at 2h. (near Mizusawa), 4h. (Helwan), 5h. (Manila), 6h. (Riverview), 7h. (Taihoku), 9h. (Kingston, Mizusawa, and Port au Prince), 16h. (La Paz and near Mostar), 18h. (Budapest), 20h. (near Batavia and near Mostar and Sarajevo).

Nov. 19d. Readings at 2h. (near Tacubaya and Oaxaca), 7h. and 8h. (near Tokyo), 14h. (near Rocca di Papa), 19h. (Batavia), 22h. (Batavia and La Paz).

Nov. 20d. Readings at 6h. (Taihoku, Manila, Hong Kong, and Zi-ka-wei), 7h. (Taihoku, Hong Kong, and Zi-ka-wei), 8h. (Taihoku and La Paz), 11h. (Batavia and Manila), 14h. (Azores), 21h. (Helwan), 23h. (Christchurch).

Nov. 21d. Readings at 0h. (near Nagasaki), 3h. (Tiflis), 4h. (near Mizusawa), 11h. (near Sarajevo), 14h. (near La Paz), 17h. (Batavia), 23h. (near Mizusawa).

Nov. 22d. 20h. 7m. 30s. Epicentre $15^{\circ}0'N$. $111^{\circ}0'E$. (as on 1917 Feb. 5d.).

$A = -.346$, $B = +.902$, $C = +.256$; $D = +.934$, $E = +.358$;

$G = -.091$, $H = +.242$, $K = -.966$.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Hong Kong	7.9	22	1 51	- 9	3 39	+ 5	4.0	—
Manila	9.6	91	e 4 24	?S	(e 4 24)	+ 6	4.8	—
Zi-ka-wei	18.8	29	e 4 31	+ 4	e 7 45	-13	—	10.2
Batavia	21.6	191	—	—	—	—	e 10.4	—
De Bilt	87.6	324	—	—	—	—	e 45.5	—

Additional readings and notes: Hong Kong gives also $PR_1 = +2m.52s$.
 Manila reading is given as at 21h. Zi-ka-wei $MN = +10.4m$. Batavia
 $e = +6m.49s$, $+10m.25s$. (taken as L), and $+12m.10s$.

Nov. 22d. Readings also at 4h. (near Tokyo), 9h. (Batavia), 10h. (Hong Kong and Manila), 11h. and 18h. (Tiflis), 21h. (La Paz), 22h. (Helwan and De Bilt).

Nov. 23d. Readings at 8h., 11h., and 17h. (Tiflis), 19h. (near Tacubaya), 21h. (Hong Kong), 22h. (Helwan and Tacubaya), 23h. (near Colima).

Nov. 24d. Readings at 2h. (Colombo (2) and Batavia), 3h. (La Paz), 8h. (Helwan), 10h. (Nagasaki), 11h. (Toronto and Victoria), 14h. (Helwan, near Mizusawa, and near Sarajevo), 15h. (Riverview), 16h. (Helwan), 18h. (Riverview, Melbourne, Adelaide, and Perth), 19h. (De Bilt), 21h. (Melbourne), 22h. (Taihoku).

Nov. 25d. Readings at 6h. (Kingston, Melbourne, and Riverview), 8h. (Oaxaca, Vera Cruz, and Tacubaya), 12h. and 13h. (Colombo), 14h. (La Paz), 15h. (Taihoku and La Paz), 16h. (Vera Cruz), 17h. (Oaxaca and Merida), 18h. (Batavia (2)), 19h. (Apia and Batavia).

Nov. 26d. Readings at 0h. (near Sarajevo), 5h. (Tiflis), 9h. (Taihoku), 12h. (Taihoku and near Sarajevo), 17h. (Tacubaya), 22h. (Batavia).

Nov. 27d. Readings at 0h. (La Paz), 4h. (Simla), 7h. (near Balboa Heights), 9h. (La Paz), 11h. (Zi-ka-wei, Helwan, Taihoku (2), and Hong Kong), 13h. (Taihoku, De Bilt, Hong Kong, and Zi-ka-wei), 19h. (near Simla), 21h. (La Paz).

Nov. 28d. Readings at 1h. (near Mizusawa), 2h. (Manila), 4h. (2), 5h., and 7h. (La Paz), 8h. (Taihoku), 12h. (Puebla), 13h. (Colombo), 14h. (near Oaxaca, Colima, Tacubaya, and Vera Cruz), 18h. (near La Paz and near Mizusawa), 20h. (Helwan).

Nov. 29d. 2h. 43m. 36s. Epicentre $28^{\circ}0'N$. $130^{\circ}0'E$. (as on 1921 June 23d.).

$$A = -\cdot568, B = +\cdot676, C = +\cdot470; \quad D = +\cdot766, E = +\cdot643;$$

$$G = -\cdot302, H = +\cdot350, K = -\cdot883.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Zi-ka-wei	8.1	295	—	—	—	—	e 6.1	—
Taihoku	8.1	250	—	—	e 3 52	+12	—	—
Hong Kong	15.4	252	3 44	0	6 16	-25	—	6.9
Manila	15.9	214	e 3 51	0	—	—	6.2	7.5
Colombo	51.9	256	15 24	?S	(15 24)	-79	—	31.4
Helwan	E. 83.2	300	54 24	?L	—	—	(54.4)	—
De Bilt	86.6	329	—	—	—	—	e 50.4	59.2

Manila gives also MN = +6.6m.

Nov. 29d. 4h. 15m. 45s. Epicentre $36^{\circ}0'N$. $141^{\circ}0'E$. (as on 1921 Aug. 22d.).

$$A = -\cdot629, B = +\cdot509, C = +\cdot588; \quad D = +\cdot629, E = +\cdot777;$$

$$G = -\cdot457, H = +\cdot370, K = -\cdot809.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	1.1	253	i 0 14	- 3	0 25	- 6	0.7	0.8
Mizusawa	E. 3.1	1	0 41	- 8	1 17	- 9	—	—
	N. 3.1	1	0 34	-15	1 13	-13	—	—
Osaka	4.7	256	1 39	+26	—	—	2.6	4.5
Kobe	5.0	256	—	—	e 2 30	+13	5.2	—
Zi-ka-wei	17.0	259	—	—	—	—	e 8.9	—

Osaka gives also MN = +3.1m.

Nov. 29d. 12h. 4m. 4s. Epicentre $43^{\circ}9'N$. $9^{\circ}5'E$. (as on 1917 April 26d.).

$$A = +\cdot711, B = +\cdot119, C = +\cdot693.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Padova	2.3	0 41	+ 5	0 58	- 5	—	—
Pola	3.3	1 32?	?L	—	—	(1.5?)	—
Zurich	3.6	e 1 7	+11	i 1 44	+ 5	—	—
Vienna	z. 6.5	2 26	?S	(2 26)	-31	i 3.6	5.2

Additional readings: Padova gives also $SR_1 = +1m.34s.$ Zurich ePV = +1m.5s., iSN = +1m.43s.

Nov. 29d. 22h. 46m. 0s. Epicentre $18^{\circ}0'S$. $173^{\circ}0'W$. (as on 1921 Nov. 6d.).

$$A = -\cdot944, B = -\cdot116, C = -\cdot309; \quad D = -\cdot122, E = +\cdot993;$$

$$G = +\cdot307, H = +\cdot038, K = -\cdot951.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	4.3	17	i 1 14	+ 7	1 57	- 1	2.4	3.0
Riverview	35.7	236	e 7 50	+31	e 12 50	-16	e 16.1	19.6
Berkeley	73.4	40	—	—	—	—	e 31.8	34.5
Victoria	79.8	31	—	—	—	—	37.6	40.0
La Paz	98.4	111	17 58	?PR ₁	e 28 38	?SR ₁	46.8	53.3
Toronto	104.8	48	—	—	—	—	e 57.4	61.8
De Bilt	145.9	2	e 20 30	[+40]	—	—	e 81.0	90.7
Vienna	148.8	349	19 58	[+ 4]	—	—	—	22.5
Strasbourg	149.4	358	20 0	[+ 5]	—	—	—	—
Rocca di Papa	155.7	350	e 20 48	[+45]	—	—	—	28.0

Additional readings: Riverview gives also eP? = +8m.54s., MN = +22.5m.
De Bilt MN = +92.8m. Vienna iZ = +20m.1s. Strasbourg ePE = +20m.4s.

Nov. 29d. Readings also at 2h. (La Paz), 10h. (Riverview), 11h. (Helwan), 13h. (La Paz), 18h. (Vienna, Melbourne, and Riverview), 19h. (De Bilt), 20h. (Helwan), 21h. (La Paz and Honolulu), 22h. (Helwan).

Nov. 30d. Readings at 1h. (near Tokyo), 3h. (Colombo), 8h. (La Paz), 12h. (3) and 16h. (Tiflis).

Dec. 1d. 10h. 49m. 32s. Epicentre $30^{\circ}0'N$, $119^{\circ}5'E$.

A = -0.426, B = +0.754, C = +0.500 ; D = +0.870, E = +0.492 ;
G = -0.246, H = +0.435, K = -0.866.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Zi-ka-wei	2.1	54	i 1 0	?S	(i 1 0)	+ 2	(e 1.2)	3.5
Taihoku	5.3	157	—	—	e 4 9	?	5.1	—
Hokoto	6.5	180	—	—	4 10	?	4.6	—
Hong Kong	9.0	213	6 16	?	—	—	7.2	7.8
Nagasaki	9.3	70	2 13	- 7	(3 53)	-17	3.9	4.5
Kobe	14.0	66	e 3 27	+ 1	—	—	i 5.4	10.1
Osaka	14.3	67	—	—	6 15	0	7.4	8.2
Manila	15.5	175	e 4 58	+72	—	—	10.5	—
Tokyo	17.9	66	e 4 19	+ 3	—	—	e 8.4	10.4
Simla	36.2	282	20 22	?L	—	—	(20.4)	21.3
Batavia	38.2	200	e 8 26	+46	i 14 34	+53	e 26.9	—
Colombo	43.8	245	15 52	?S	(15 52)	+53	30.5	33.0
Helwan	E. 74.2	295	31 28	?L	—	—	(31.5)	—
Vienna	76.0	319	11 54	- 1	21 35	- 2	e 37.0	44.1
Hamburg	76.7	325	—	—	—	—	e 38.5	43.0
Pola	79.2	316	22 28	?S	(22 28)	+14	42.5?	44.8
De Bilt	E. 79.9	325	—	—	e 22 18	+ 4	39.5	45.3
	N. 79.9	325	—	—	e 22 15	- 7	—	45.6
Dyce	79.9	332	—	—	—	—	40.4	43.4
Strasbourg	80.6	321	—	—	—	—	e 43.4	50.8
Uccle	81.1	324	—	—	—	—	e 38.5	45.4
Florence	81.4	316	36 18	?L	—	—	(36.3)	44.5
Rocca di Papa	81.6	314	—	—	—	—	e 44.3	45.7
Eskdalemuir	81.6	331	—	—	e 22 19	-23	41.5	46.1
Besançon	82.4	320	43 21	?L	—	—	(43.4)	45.5
Bidston	82.9	329	—	—	—	—	44.5	47.5
Kew	82.9	328	—	—	—	—	—	49.5
Oxford	83.2	328	—	—	—	—	43.2	47.1
Paris	83.2	323	—	—	e 34 28	?	42.5	45.5
Tortosa	89.2	318	e 43 47	?L	—	—	e 46.5	51.6
Coimbra	94.8	322	37 19	?	—	—	50.0	52.7
San Fernando	E. 96.3	319	—	—	—	—	—	56.0

Additional readings and notes: Nagasaki gives also MN = +4.6m. Kobe MN = +9.2m. Osaka MN = +8.4m. Mizusawa ($\Delta = 20^{\circ}0'$ Az. = 57°), PE = 10h.47m.42s., PN = 10h.48m.24s., SE = 10h.53m.49s., SN = 10h.53m.48s. Batavia i = +15m.15s. Vienna iZ = +12m.2s. Pola MN = +44.7m. Strasbourg MN = +44.6m. Eskdalemuir MN = +48.4m. Coimbra LN = +51.7m. San Fernando MN = +56.5m.

Dec. 1d. 17h. 53m. 10s. Epicentre $24^{\circ}0'N$, $124^{\circ}0'E$. (as on 1919 Dec. 16d.).

A = -0.511, B = +0.757, C = +0.407 ; D = +0.829, E = +0.559 ;
G = -0.228, H = +0.337, K = -0.914.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	2.5	294	0 36	- 3	—	—	1.0	1.3
Hokoto	4.1	275	1 4	0	—	—	1.4	—
Zi-ka-wei	7.5	343	e 1 54	0	e 3 26	+ 2	—	4.5
Hong Kong	9.2	262	4 3	?S	(4 3)	- 5	—	5.6
Helwan	80.4	298	53 50	?L	—	—	(53.8)	—
Hamburg	83.9	327	—	—	—	—	e 43.8	52.8
De Bilt	87.2	327	—	—	—	—	e 46.8	55.2
Uccle	88.3	327	—	—	—	—	—	46.8
Eskdalemuir	88.8	333	—	—	—	—	40.8	—
Stonyhurst	89.5	332	e 57 50	?L	—	—	(e 57.8)	—

Additional readings Zi-ka-wei gives also MN = +4.3m., MZ = +4.4m. De Bilt MN = +56.5m.

Dec. 1d. Readings also at 5h. (Rocca di Papa), 6h. (near Rocca di Papa and Florence), 7h. (Hong Kong), 12h. (La Paz and Zi-ka-wei), 14h. (Florence), 15h. (near La Paz, near Tokyo, and near Rocca di Papa (2) and Florence (2)), 17h. (near Tokyo and Mizusawa), 18h. (near Mizusawa).

Dec. 2d. 20h. 43m. 8s. Epicentre $20^{\circ} \cdot 6S$. $168^{\circ} \cdot 8E$. (as on 1920 Sept. 20d.).

$$A = -\cdot 918, B = +\cdot 182, C = -\cdot 352; \quad D = +\cdot 194, E = +\cdot 981; \\ G = +\cdot 345, H = -\cdot 068, K = -\cdot 936.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia	19.7	73	—	—	—	—	11.9	—
Riverview	20.5	226	i 4 52	+ 5	8 56	+22	e 10.4	10.8
Melbourne	26.8	225	6 16	+20	10 46	+ 9	13.0	15.5
Adelaide	30.1	235	—	—	e 11 52	+16	e 16.4	19.4
Batavia	61.6	275	e 10 20	- 3	i 18 40	- 3	—	—
Honolulu	E. 53.0	40	—	—	—	—	e 24.9	—
Helwan	E. 140.7	291	89 52	?L	—	—	(89.9)	—

Additional readings: Riverview gives also $MN = +11.3m$. Batavia $i = +13m.40s$. (?PR₁).

Dec. 2d. Readings also at 1h. (La Paz), 2h. (La Paz and Helwan), 5h. (Manila), 6h. (Riverview), 8h. (Apia, Christchurch, and Riverview), 10h. (Algiers), 13h. (La Paz), 18h. (Zi-ka-wei and Tiflis), 21h. (near Mizusawa).

Dec. 3d. Readings at 5h. (Riverview), 9h. (La Paz and Tiflis), 10h. (Helwan), 11h. (Tiflis), 13h. (near La Paz), 14h. (Oaxaca, Vera Cruz, and Tacubaya), 15h. (Helwan), 21h. (Riverview), 23h. (Algiers).

Dec. 4d. Readings at 7h. and 9h. (La Paz), 12h. (Batavia and near Mizusawa), 16h. (Taihoku), 17h. (Batavia).

Dec. 5d. Readings at 1h. (near Nagasaki), 2h. (La Paz).

Dec. 6d. 13h. 26m. 16s. Epicentre $40^{\circ} \cdot 0N$. $45^{\circ} \cdot 5E$.

$$A = +\cdot 537, B = +\cdot 546, C = +\cdot 642; \quad D = +\cdot 713, E = -\cdot 701; \\ G = +\cdot 451, H = +\cdot 458, K = -\cdot 766.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tiflis	1.7	342	0 44	+18	e 0 50	+ 2	0.9	—
Helwan	E. 15.4	233	8 44	?L	—	—	(8.7)	—
Lemberg	18.0	310	—	—	e 7 14	-26	e 9.2	13.3
Vienna	22.3	301	5 9	0	9 11	0	e 13.2	14.2
Pompeii	E. 23.4	282	5 49	+28	—	—	—	—
Pola	23.7	292	—	—	e 9 40	+ 2	—	—
Rocca di Papa	24.7	285	i 5 41	+ 6	9 50	- 7	16.4	19.6
Moncalieri	28.0	293	e 3 29	?	(10 38)	-21	10.6	—
Strasbourg	28.0	300	e 5 44	-24	—	—	e 15.7	—
De Bilt	30.0	307	—	—	e 11 44	+10	14.7	20.5
Uccle	30.3	305	—	—	—	—	—	14.7
Paris	31.5	301	—	—	—	—	17.7	22.7
Stonyhurst	34.7	310	e 16 14	?L	—	—	(e 16.2)	23.7
Dyce	34.9	316	—	—	—	—	19.7	—

Additional readings: Vienna gives also $iZ = +5m.26s$. De Bilt $MN = +16.1m$. Paris reading for L is increased by 20m.

Dec. 6d. Readings also at 1h. (Azores), 12h. (Batavia and La Paz), 13h. (Tiflis), 15h. (Vera Cruz).

Dec. 7d. 17h. 27m. 20s. (I) } Epicentre $2^{\circ}1'N. 127^{\circ}8'E.$ (as on 1921 July 15d.).
 18h. 40m. 40s. (II) }

A = -0.612, B = +0.790, C = +0.037 ; D = +0.790, E = +0.613 ;
 G = -0.022, H = +0.029, K = -0.999.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Manila	14.2	332	3 40	+11	(6 20)	+ 7	6.3	—
II	14.2	332	3 29	0	—	—	—	—
I Batavia	22.5	248	i 4 56	-15	i 9 1	-14	e 15.7	—
II	22.5	248	i 5 15	+ 4	i 7 48	-87	i 11.0	—
I Taihoku	23.7	346	e 7 12	?	—	—	—	—
I Hong Kong	24.1	328	5 29	0	(9 40)	- 6	9.7	—
II	24.1	328	5 20	- 9	9 5	-41	12.4	—
I Zi-ka-wei	29.7	349	6 25	0	e 11 52	+23	—	17.4
I Osaka	33.3	11	8 23	+84	—	—	—	14.6
I Kobe	33.3	11	e 7 5	+ 6	—	—	—	9.4
I Perth	35.9	197	—	—	12 40	-29	—	—
I Adelaide	38.4	165	—	—	i 13 22	-22	e 19.9	24.7
I Riverview	42.1	150	e 7 43	-29	i 14 30	- 6	e 24.0	28.2
I Sydney	42.1	150	8 34	+22	14 28	- 8	22.5	30.7
I Melbourne	43.0	160	8 58?	+40	15 16	+28	24.9	30.8
I Colombo	48.0	277	8 40	-14	14 10	-94	27.7	33.8
I Kodaikanal	50.6	281	9 52	+41	—	—	30.1	33.0
I Helwan	E. 94.5	300	13 40	- 1	—	—	—	—
I Victoria	100.8	40	—	—	—	—	—	64.2
I Hamburg	104.3	327	—	—	e 24 40	-116	e 52.7	54.7
I Pola	105.1	318	—	—	24 40	-123	74.7	—
I Rocca di Papa	106.9	315	—	—	—	—	60.1	—
I Strasbourg	107.6	322	—	—	—	—	—	63.1
I De Bilt	107.6	326	—	—	e 25 14	-112	e 52.7	62.2
II	107.6	326	—	—	—	—	e 55.3	58.1
I Dyce	108.4	334	—	—	—	—	55.5	56.6
I Uccle	108.6	325	—	—	e 28 40	+85	—	54.7
I Besançon	109.3	321	—	—	—	—	62.7	—
I Edinburgh	109.7	334	—	—	—	—	56.7	—
I Eskdalemuir	110.1	333	—	—	e 28 40	+71	53.7	66.7
I Coimbra	121.8	322	e 22 10	?PR ₁	—	—	41.7	—
I La Paz	158.8	134	i 20 27	[+20]	31 24	?	72.3	—

Additional readings: Kobe I gives also MN = +8.9m. Adelaide I i = +16m.34s. Riverview I eSR = +17m.33s. and +17m.57s., MN = +29.5m. Melbourne I SR₁ = +18m.22s. Rocca di Papa I L = +60.5m. De Bilt I MN = +57.7m., II MN = +59.2m. Eskdalemuir I MN = +59.0m.

Dec. 7d. Readings also at 0h. (near Mizusawa), 1h. (Eskdalemuir), 5h. (Tiflis), 12h. (Batavia), 13h. (La Paz), 14h. (Apia), 21h. (near Belgrade and Sarajevo), 22h. (Rocca di Papa).

1921. Dec. 8d. 12h. 31m. 24s. Epicentre $36^{\circ}0'N. 139^{\circ}0'E.$

(As on 1921 Feb. 14d.).

A = -0.611, B = +0.531, C = +0.588 ; D = +0.656, E = +0.755 ;
 G = -0.444, H = +0.386, K = -0.809.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Numadu	0.2	320	0 30	+26	0 35	+29	0.7	—
Maebasi	0.4	8	0 47	+41	—	—	1.0	—
Tokyo	0.8	118	i 0 15	+ 3	—	—	0.4	—
Tukubasan	0.9	76	0 15	+ 1	—	—	—	0.4
Mito	1.3	72	0 16	- 4	—	—	0.4	—
Tyosi	1.6	120	0 18	- 6	—	—	0.5	—
Gifu	1.9	245	1 2	?S	(1 2)	+ 9	1.5	4.9
Kyoto	2.8	250	1 55	?S	(1 55)	+38	2.6	3.0
Osaka	3.2	248	—	—	1 19	- 9	2.5	3.0
Kobe	3.4	248	—	—	1 22	-12	2.6	2.7
Mizusawa	E. 3.5	28	1 0	+ 5	1 40	+ 3	—	—
N. Akita	3.5	28	0 58	+ 3	1 41	+ 4	—	—
	3.8	13	1 0	+ 1	—	—	2.0	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Hakodate	5.9	12	1 43	+12	—	—	3.0	3.5
Sapporo	7.3	13	1 45	— 6	—	—	3.4	—
Hukuoka	7.4	254	2 13	+21	3 43	+22	4.4	4.8
Nagasaki	8.2	250	2 20	+16	—	—	4.1	5.4
Zinsen	10.1	282	(1 54)	-37	1 54	?P	4.4	4.8
Ootomari	11.0	14	2 48	+ 4	(4 39)	-15	4.6	6.6
Zi-ka-wei	15.4	257	i 3 57	+13	e 7 1	+20	—	18.2
Taihoku	18.6	239	e 4 27	+ 3	—	—	8.4	—
Hong Kong	25.5	244	6 23	+40	—	—	—	17.1
Manila	26.8	222	e 4 40	-76	—	—	—	—
Simla	50.9	283	26 54	?L	—	—	(26.9)	—
Batavia	51.9	222	e 9 16	- 3	i 16 31	-12	—	—
Honolulu	56.2	87	—	—	—	—	e 24.3	26.6
Kodaikanal	61.1	261	39 54	?	—	—	41.2	41.0
Colombo	61.2	259	18 36	?S	(18 36)	- 2	—	42.6
Victoria	68.5	45	—	—	(19 43)	-25	19.7	48.2
Riverview	70.8	170	e 18 42	?	e 21 24	+48	—	—
Sydney	70.8	170	20 18	?S	(20 18)	-18	—	42.8
Hamburg	80.2	332	i 12 17	- 3	i 22 23	- 2	e 42.6	46.2
Dyce	81.3	341	i 13 40	+73	i 22 36	- 2	43.6	—
Vienna	81.5	326	i 12 27	- 1	—	—	—	23.0
Edinburgh	82.7	340	—	—	—	—	40.6	53.6
Eskdalemuir	83.2	339	i 12 33	- 4	i 22 50	- 9	40.6	47.0
De Bilt	E. 83.2	333	—	—	e 22 53	- 6	e 42.6	52.0
	N. 83.2	333	—	—	e 22 55	- 4	—	56.7
Uccle	84.5	333	e 12 39	- 6	23 2	-12	—	—
Strasbourg	85.0	330	12 42	- 6	23 1	-18	e 47.6	58.6
Pola	85.2	325	11 7	?	e 23 16	- 5	45.6?	50.9
Helwan	E. 85.4	304	23 36	?S	(23 36)	+13	—	—
Kew	85.6	336	—	—	—	—	—	52.6
Padova	85.7	327	23 15	?S	(23 15)	-12	47.0	56.0
Oxford	85.7	338	—	—	23 3	-24	39.9	53.1
Besançon	86.8	330	12 54?	- 4	23 16	-23	50.6	—
Paris	86.8	333	e 12 52	- 6	i 23 16	-23	45.6	50.6
Moncalieri	87.8	328	13 9	+ 5	25 58	+128	34.8	56.9
Pompeii	87.9	321	24 4	?S	(24 4)	+13	—	—
Rocca di Papa	88.0	323	e 12 42	-23	23 45	- 7	e 45.5	50.0
Marseilles	90.3	329	—	—	e 52 36	?L	58.6	—
Toronto	93.0	27	—	—	—	—	53.4	59.6
Tortosa	94.2	330	—	—	—	—	e 51.6	59.1
Granada	99.1	331	e 17 58	?PR ₁	i 29 39	?SR ₁	54.8	—
Rio Tinto	99.7	333	55 36	?L	—	—	(55.6)	66.6
San Fernando	100.7	332	19 36	?PR ₁	—	—	—	65.1
Cape Town	132.0	254	50 40	?L	—	—	(50.7)	—
La Paz	149.0	58	20 57	[+63]	35 4	?	71.6	—

Additional readings and notes : Osaka gives also MN = +2.9m. Kobe MN = +3.0m. Hakodate MN = +4.0m. Hukuoka MN = +5.0m. Zinsen gives P = 12h.31m.13s. Ootomari MN = +7.8m. Zi-ka-wei SR₁N = +7m.41s., SR₁E = +7m.48s., MN = +9.1m. Hong Kong PR₁ = +8m.57s. or +8m.20s. Batavia e = +13m.45s. Honolulu eN = +23m.14s. Hamburg MZ = +53.6m. Vienna i = +14m.59s. (?PR₁). All readings are given as on 9d. Eskdalemuir PR₁Z? = +15m.48s., MN = +53.2m. Pola MN = +55.6m. Paris MN = +53.6m. Rocca di Papa iP = +12m.54s., PR₁ = +17m.0s., iS = +23m.42s. Toronto eL = +57.2m. San Fernando MN = +70.1m.

Dec. 8d. Readings also at 0h. (Batavia), 4h. (near Sarajevo), 12h. (near Tokyo), 13h. (near Mizusawa (3), Tokyo (5), and Osaka), 14h. (Stonyhurst, Tiflis, and near Tokyo (2)), 16h. (near Mizusawa and Tokyo), 17h. (Stonyhurst and near Tokyo), 18h. (Coimbra and near Tokyo and Mizusawa), 19h. (near Tokyo and Mizusawa), 21h. (La Paz).

Dec. 9d. Readings at 0h. (near Tokyo (2)), 3h. (La Paz), 5h. (Batavia and Tiflis), 11h. (Apia, Christchurch, Tiflis, and Riverview), 12h. (Helwan), 13h. (Rio Tinto and La Paz), 20h. and 22h. (Taihoku).

Dec. 10d. Readings at 1h. (Manila), 2h. (Helwan), 4h. (La Paz and Taihoku), 6h. (Taihoku), 11h. (La Paz), 12h. (Helwan), 17h. (near Simla).

Dec. 11d. Readings at 0h. (Batavia), 3h. (La Paz and near Tokyo), 8h. (Vera Cruz and Oaxaca), 9h. (near Mizusawa and Sapporo), 17h. (Taihoku), 23h. (Taihoku and near Mizusawa and Tokyo).

Dec. 12d. 11h. 2m. 10s. Epicentre $40^{\circ}3'N$. $139^{\circ}5'E$. (as on 1921 Oct. 5d.).

$$A = -.580, B = +.495, C = +.647.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Mizusawa	1.7	0 25	- 1	0 49	+ 1	—	—
Hakodate	1.7	e 0 29	+ 3	—	—	0.5	1.0
Sapporo	3.1	0 26	-23	0 37	-49	1.0	—
Mito	4.0	1 2	0	—	—	2.0	2.4
Tyosi	4.7	e 1 10	- 3	—	—	2.4	2.9

Mizusawa gives also SN = +0m.47s.

Dec. 12d. Readings also at 0h. (near Mizusawa (2)), 2h. (De Bilt, Helwan, and Kodaikanal), 6h. (La Paz), 9h. (Colombo), 10h. (Tokyo), 16h. (Mizusawa), 17h. (Tiflis), 19h. (La Paz).

Dec. 13d. 6h. 28m. 42s. Epicentre $43^{\circ}9'N$. $9^{\circ}5'E$. (as on 1921 Nov. 29d.).

$$A = +.711, B = +.119, C = +.693.$$

	Δ °	Az.	P. m. s.	O - C. s.	S. m. s.	O - C. s.	M. m.
Chur	2.9	0	e 0 48	+ 3	i 1 16	- 4	—
Zurich	E. 3.6	350	e 0 58	+ 2	i 1 34	- 5	1.6
	N. 3.6	350	e 0 55	- 1	i 1 34	- 5	1.7
Vienna	Z. 6.5	45	i 1 45	+ 6	—	—	—

No additional readings.

Dec. 13d. Readings also at 2h. (Batavia and La Paz), 3h. (Colombo, Helwan, and Riverview), 9h. and 12h. (La Paz), 19h. (Taihoku).

Dec. 14d. Readings at 7h. and 9h. (Colombo), 13h. (near Tokyo), 14h. (Batavia), 19h. (Taihoku).

Dec. 15d. Readings at 6h. (Batavia), 7h. (Manila and Riverview), 8h. (Riverview and La Paz), 11h. (Manila), 17h. (near Tokyo), 19h. (near Cape Town), 20h. (Manila).

Dec. 16d. 2h. 37m. 15s. Epicentre $14^{\circ}5'N$. $145^{\circ}5'E$. (as on 1919 Jan. 11d.).

$$A = -.798, B = +.548, C = +.250; \quad D = +.566, E = +.824;$$

$$G = -.206, H = +.142, K = -.968.$$

	Δ °	Az.	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tokyo	21.8	347	4 50	-13	(e 8 31)	-30	e 8.5	8.8
Osaka	22.1	338	5 23	+17	—	—	—	10.4
Kobe	22.3	337	e 4 45	-24	—	—	6.5	—
Manila	23.8	274	e 5 25	- 1	9 41	+ 1	9.7	10.8
Batavia	43.6	244	8 24	+ 1	—	—	—	—
De Bilt	105.1	336	—	—	—	—	e 53.8	—
Uccle	106.4	336	—	—	—	—	e 50.8	—
La Paz	147.5	98	19 30	[-22]	24 24	?PR ₁	—	—

Additional readings : Osaka gives also MN = +12.6m. Manila MN = +9.8m.
Batavia iE = +10m.10s., i = +13m.49s.

Dec. 16d. Readings also at 1h. (Zi-ka-wei and near Mizusawa), 4h. (Zi-ka-wei and Taihoku), 11h. (Apia and Taihoku), 13h. Ootomari), 14h. (Barcelona), 16h. (Barcelona and near Lick), 18h. (Rocca di Papa), 22h. (Zi-ka-wei).

Dec. 17d. Readings at 1h. (near Colima), 9h. (Belgrade), 12h. (Apia), 17h. (Taihoku), 18h. (near Lick), 23h. (Helwan, Rocca di Papa, and Vera Cruz).

Dec. 18d. 10h. 16m. 24s. Epicentre $2^{\circ}08.14^{\circ}0W$. (as on 1920 July 4d.).

A = +.970, B = -.242, C = -.035 ; D = -.242, E = -.970 ;
G = -.034, H = +.008, K = -.999.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Coimbra	42.5	6	8 56	+41	14 36	- 6	18.6	21.6
Rocca di Papa	50.0	27	e 25 18	?L	—	—	(e 25.3)	26.3
Florence	51.5	24	24 40	?L	—	—	(24.7)	24.8
Helwan	E. 53.7	50	33 36	?L	—	—	(33.6)	—
Uccle	55.1	14	—	—	—	—	—	15.6
La Paz	55.2	252	9 40	0	—	—	27.6	30.6
Toronto	73.9	317	—	—	—	—	41.9	46.0
Ann Arbor	N. 76.5	314	—	—	—	—	73.6	—
Victoria	104.2	320	—	—	—	—	30.3	37.2

Additional readings and notes: Coimbra gives also LN = +20.4m. All readings are increased by 10m. Rocca di Papa ePN = +26m.0s. and iPN = +26m.6s. Florence P = +24m.35s.

1921. Dec. 18d. 15h. 29m. 24s. Epicentre $2^{\circ}5S. 71^{\circ}0W$.

A = +.325, B = -.945, C = -.044 ; D = -.946, E = -.326 ;
G = -.014, H = +.041, K = -.999.

A focal depth 0.080 is assumed. See note at end.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
La Paz	-2.0	14.3	169	i 2 53	-10	i 4 54	-32	—	—
Balboa Hts.	E. -2.0	14.3	324	3 22	+19	5 46	+20	7.2	8.3
	N. -2.0	14.3	324	3 16	+13	5 56	+30	7.5	8.4
Port au Prince	-3.4	21.1	357	e 4 25	+12	6 34	-59	7.1	7.8
Porto Rico	-3.4	21.4	15	4 26	+ 9	8 1	+21	—	8.1
Merida	4.9	29.7	323	6 51	+75	(11 16)	+77	11.3	11.4
Oaxaca	-5.1	32.1	310	5 33	-25	(10 18)	-23	10.3	11.1
Vera Cruz	-5.2	32.9	315	6 21	+16	(10 49)	- 5	10.8	11.1
Rio de Janeiro	-5.3	33.8	130	i 6 0	-13	10 36	-32	14.0	—
Puebla	-5.3	34.3	312	6 48	+30	(11 38)	+21	11.6	11.9
Tacubaya	-5.4	35.3	310	6 20	- 7	(11 17)	-15	11.3	11.5
Colima	-5.8	38.3	307	6 35	-18	9 39	?PR ₁	12.1	12.3
Cheltenham	-6.2	41.6	356	7 18	+ 1	12 58	- 3	—	13.2
	E. -6.2	41.6	355	e 7 16	- 2	i 12 55	- 9	e 21.6	22.4
Washington	-6.2	41.8	355	7 17	- 1	12 48	-16	—	13.1
Mazatlan	-6.4	43.0	311	(7 45)	+18	7 45	?P	—	11.0
Fordham	E. -6.4	43.5	358	7 33	+ 2	13 24	- 1	—	—
	N. -6.4	43.5	358	7 27	- 4	13 18	- 7	16.1	16.4
St. Louis	-6.6	44.8	340	i 7 39	- 1	(i 13 36)	- 5	i 13.6	13.7
Ithaca	E. -6.6	45.2	356	7 56	+13	13 54	+ 8	—	14.2
Ann Arbor	-6.8	46.3	350	7 48	- 3	13 54	- 5	—	14.0
Northfield	-6.8	46.7	0	7 51	- 3	14 11	+ 6	—	—
Chicago	-6.8	46.8	345	6 44	-71	12 56	-71	—	13.1
Toronto	-6.8	46.8	353	8 24	+29	i 15 6	+59	e 21.1	—
Ottawa	-7.0	46.1	357	E 5	+ 1	14 26	+ 4	e 19.6	—
Tucson	N. -7.3	51.3	318	8 14	-12	14 59	- 3	—	15.2
Denver	-7.4	52.5	329	7 36	-58	(14 36)	-40	14.6	14.6
Lick	N. -8.0	61.5	318	7 33	-117	15 12	-111	—	—
	E. -8.0	61.5	318	7 36	-114	15 22	-101	—	—

Continued on next page.

		Corr. for Focus		Δ	Az.	P.		O-C.	S.		O-C.	L.	M.
						m.	s.	s.	m.	s.	s.	m.	m.
Berkeley	E.	-8.0	62.2	318		e 9	45?	+11	e 17	30?	+19	—	—
	N.	-8.0	62.2	318		e 9	41?	+7	e 17	29?	+18	—	—
Victoria		-8.4	68.2	326		8	56	-75	(i 17	47)	-34	e 34.6	35.5
Coimbra	E.	-8.6	71.2	47	i 10	36	+7	i 19	16	+20	27.6	28.1	—
San Fernando		-8.6	71.6	51	10	38	+6	19	24	+23	—	23.8	—
Granada		-8.7	73.8	51	i 10	51	+5	i 19	47	+21	—	—	—
Tortosa		-9.0	77.9	48	11	11	+1	20	25	+12	32.1	32.9	—
Sitka	E.	-9.1	78.6	331	11	19	+5	20	23	+3	—	20.6	—
	N.	-9.1	78.6	331	11	25	+11	—	—	—	—	20.8	—
Algiers		-9.1	78.9	52	i 11	16	0	i 20	36	+12	32.6	38.6	—
Barcelona		-9.1	79.2	48	11	18	0	i 20	38	+11	e 33.0	33.3	—
Oxford		-9.2	79.7	37	i 11	23	+3	i 20	36	+4	26.7	—	—
Stonyhurst		-9.2	79.7	36	11	24	+4	(20	36)	+4	20.6	28.3	—
Eskdalemuir		-9.2	79.7	33	i 11	22	+2	i 20	40	+8	31.6	—	—
Edinburgh		-9.2	80.0	33	11	18	-4	20	49	+13	—	26.7	—
Kew		-9.2	80.2	37	12	36	+73	—	—	—	—	26.6	—
Dyce	E.	-9.2	81.0	30	i 11	30	+2	i 20	51	+3	24.9	26.6	—
	N.	-9.2	81.0	30	i 11	30	+2	i 20	50	+2	—	—	—
Paris		-9.2	81.2	40	i 11	26	-4	i 20	53	+3	29.6	33.6	—
Marseilles		-9.3	81.9	46	i 11	36	+2	21	6	+9	31.1	34.5	—
Uccle		-9.3	82.8	39	i 11	35	-4	i 21	10	+2	—	31.1	—
Besançon		-9.3	83.1	42	11	38	-3	21	6	-6	29.6	—	—
De Bilt		-9.3	83.6	38	i 11	45	+1	21	19	+1	30.6	31.3	—
Moncalieri		-9.4	83.9	44	i 11	37	-9	21	21	+1	—	26.1	—
Strasbourg		-9.4	84.5	41	i 11	43	-7	e 21	27	0	e 34.6	—	—
Zurich		-9.4	84.9	43	e 11	45	-7	i 21	23	-9	—	—	—
Florence		-9.5	86.2	46	11	57	-2	21	38	-7	—	35.8	—
Padova		-9.5	86.8	44	11	59	-4	—	—	—	—	—	—
Hamburg		-9.5	86.8	37	i 11	54	-9	i 21	32	-20	e 30.6	—	—
Rocca di Papa		-9.5	87.0	48	i 11	54	-10	—	—	—	e 35.2	—	—
Pola		-9.6	88.2	45	i 12	13	+2	i 21	46	-21	e 31.5	32.3	—
Honolulu		-9.6	88.2	292	12	21	+10	21	55	-12	—	—	—
Cape Town		-9.6	88.2	125	11	55	-16	21	28	-39	—	26.0	—
Pompeii	E.	-9.6	88.3	49	12	36	+25	24	6	? SR ₁	(40.1)	59.1	—
Vienna		-9.7	90.2	41	i 12	10	-12	21	52	-37	—	—	—
Mostar		-9.7	91.0	47	e 12	1	-26	i 21	41	-57	—	40.3	—
Sarajevo		-9.7	91.3	46	12	20	-8	—	—	—	—	—	—
Belgrade		-9.8	92.8	45	i 12	23	-13	i 21	57	-60	e 29.5	39.5	—
Apia		-10.0	99.8	258	—	—	—	—	—	—	—	22.6	—
Helwan	E.	-10.1	101.9	60	14	18	+52	—	—	—	—	30.6	—
Riverview		—	126.1	223	e 16	37	+27	e 28	50	-44	e 51.4	62.1	—
Sydney		—	126.1	223	19	51	? PR ₁	—	—	—	40.0	40.7	—
Melbourne		—	127.7	217	e 19	48	? PR ₁	—	—	—	55.1?	71.5	—
Hakodate		—	131.5	329	e 17	40	[-102]	—	—	—	—	—	—
Mizusawa	E.	—	133.2	325	18	19	[-67]	20	55	? PR ₁	—	—	—
	N.	—	133.2	325	18	21	[-65]	20	56	? PR ₁	—	—	—
Adelaide		—	133.4	215	e 20	36	? PR ₁	e 29	42	?	e 40.6	74.6	—
Tokyo		—	136.3	323	18	7	[-86]	21	22	? PR ₁	22.9	24.1	—
Simla		—	138.6	42	18	30	[-67]	—	—	—	—	62.1	—
Osaka		—	139.5	326	18	26	[-72]	—	—	—	—	39.6	—
Kobe		—	139.7	326	i 18	9	[-90]	—	—	—	—	21.9	—
Bombay		—	141.0	61	18	26	[-75]	—	—	—	—	—	—
Hukuoka		—	143.0	330	18	29	[-76]	20	37	?	23.4	—	—
Kodaikanal		—	147.7	76	18	48	[-64]	—	—	—	32.4	32.9	—
Zi-ka-wei		—	149.0	339	e 18	46	[-68]	—	—	—	—	41.2	—
Colombo		—	150.6	80	e 19	12	[-45]	25	6	? PR ₁	31.6	39.6	—
Taihoku		—	154.4	333	e 19	5	[-56]	—	—	—	—	—	—
Hong Kong		—	159.6	346	18	56	[-72]	—	—	—	42.9	43.1	—
Manila		—	163.1	317	e 19	1	[-69]	28	31	?	43.6	—	—
Batavia		—	171.0	166	19	5	[-70]	28	5	?	e 35.6	—	—

Additional readings and notes: La Paz gives also $i = +5m.9s.$, $T_0 = 15h.29m.49s.$
 Port au Prince $iPE = +4m.29s.$, $iPNW = +4m.31s.$, $MNW = +8.6m.$
 Cheltenham $iSN = +12m.49s.$, $MN = +13.4m.$, Georgetown $iN = +10m.11s.$ and $+11m.54s.$, $iSN = +12m.59s.$ Mainka readings $PE = +7m.11s.$, $iSE = +13m.39s.$ Fordham $PR_1 = +9m.24s.$, $PR_2 = +10m.24s.$
 St. Louis $iS = +10m.42s.?$ ($?PR_1$). The true S being given as L . Ann Arbor $PE = +7m.42s.$ Toronto $PR_1 = +12m.6s.$, $iSR_1 = +18m.6s.$, $eL = +28.8m.$, $L = +29.5m.$ Ottawa $iNV = +11m.5s.$, $SR_1? = +16m.50s.$, $T_0 = 15h.29m.27s.$ Lick $PR_1NZ = +9m.39s.$, $PSEN = +15m.30s.$
 Berkeley $iSN = +17m.44s.?$, $iSE = +17m.50s.?$ Victoria $S = +11m.53s.$, iS is given as iL . Coimbra $PR_1 = +13m.46s.$, $SR_1 = +23m.12s.$, $i = +23m.21s.$, $LN = +27.5m.$, $MN = +30.8m.$, $T_0 = 15h.29m.21s.$

Notes continued on next page.

San Fernando MN = +26.6m. Algiers PR₁ = +14m.36s. Barcelona PR₁ = +14m.33s., PR₂ = +16m.17s., SR₁? = +24m.38s. Oxford PR₁ = -14m.42s. Stonyhurst S = -14m.48s. (?PR₁). The true S is given as L. Eskdalemuir PR₁? = +14m.36s., iSR₁?N = +24m.40s. Dyce also gives sets of Milne-Shaw and Milne readings. Paris SR₁ = -24m.57s. Marseilles PR₁ = +14m.48s., SR₁ = +25m.9s., eL = +35.6m. Uccle i = +13m.48s., PR₁ = +14m.50s., iSR₁ = +25m.11s., iSR₂ = +27m.26s. De Bilt e = +21m.10s. and +25m.20s., MN = +30.8m. Moncalieri MN = +26.7m. Strasbourg iPE = +11m.47s., SR₁ = +25m.9s., eL = +30.6m. Zurich iP = +11m.48s., i = +25m.31s. Florence P = +11m.49s. and +11m.51s. Padova PR₁ = +12m.11s., +12m.15s., +16m.34s., and SR₁ = +26m.34s. Hamburg iZ = +15m.13s., iS! = +25m.44s., e = +30m.36s. Rocca di Papa SN = +14m.12s., SE = +14m.30s., eLN = +35.7m. Pola SR₁ = +27m.26s., MN = +31.9m. Honolulu PR₁N = +15m.39s., SR₂N = +30m.56s. Pompeii L given as P of a later shock. Vienna i = +26m.29s. Mostar, Sarajevo, and Belgrade give a great many PR and SR phases. Riverview PS = +30m.2s. and +40m.37s. Melbourne SR₁ = +36m.42s., SR₂ = +40m.48s., L = +47.6m. Adelaide e = +24m.0s., i = +37m.24s. Kobe MN = +23.3m. Zi-ka-wei PMZ₁ = +21m.25s. and PMZ₂ = +22m.44s. Batavia iN = +19m.41s., i = +28m.25s.

The assumption of so exceptional a focal depth as 0.080 requires very full scrutiny. First let us examine T₀, which may be obtained from the S-P residuals independently of the position of the epicentre. There is a curious difference between the values given by the stations near the epicentre, as far as Ann Arbor ($\bar{\Delta}$ = 46.3) and those beyond. The method of computing δT_0 has been frequently described. For La Paz the error in S-P is -22s., corresponding to an error of -28s. in P, but the observed error in P is -10s., hence δT_0 = +18s. The following dozen stations give consistently positive results:—

	$\bar{\Delta}$	δT_0 s.		$\bar{\Delta}$	δT_0 s.		$\bar{\Delta}$	δT_0 s.
La Paz	14.3	+18	Puebla	34.3	+41	Wash.	41.8	+18
B. Hts.	14.3	+5	Tacub.	35.3	+3	Ford	43.5	+3
Vieques	21.4	+24	Chelt.	41.6	+6	St. Louis	44.8	-4
Rio de J.	33.8	+11	George.	41.8	-7	Ithaca	45.2	-19

Arranging these in order of magnitude, +41, +24, +19, +18, +18, +11, +7, +6, +5, +4, +3, +3, they suggest a correction δT_0 = +10s. or thereabouts. But compare those which immediately follow:—

	$\bar{\Delta}$	δT_0 s.		$\bar{\Delta}$	δT_0 s.		$\bar{\Delta}$	δT_0 s.
Ann A.	46.3	0	Coimb.	71.2	-7	Eskd.	79.7	-6
Northf.	46.7	-14	San F.	71.6	-15	Dyce	81.0	-5
Chic.	46.8	(-11)	Gran.	73.8	-13	Paris	81.2	-13
Toront.	46.8	-9	Sitka	76.5	+6	Mars.	81.9	-7
Ottawa	48.1	-3	Tort.	77.9	-13	Uccle	82.8	-12
Tucson	51.3	-23	Alg.	78.9	-15	Besan.	83.1	+1
Lick	61.5	(-6)	Barc.	79.2	-14	De B.	83.6	+1
Berkeley	62.2	-7	Oxf.	79.7	-2	Strasb.	84.5	-16

(An error of 1 min. has been assumed for Chicago and 2 min. for Lick).

These 24 observatories give consistently negative results: in order they are +6, +2, +1, +1, 0, -3, -5, -6, -6, -7, -7, -7, -9, -11, -12, -13, -13, -13, -14, -14, -15, -15, -16, -23. Median -8s., Mean -8.3s. Their indications are nearly 20 sec. earlier than those of the stations nearer the epicentre. As yet no explanation can be offered of this discrepancy, which can scarcely be accidental. In some other cases of an appreciable difference in T₀, the stations farther from the epicentre have shown a later T₀; and a reasonable inference would be that there was a smaller, earlier shock registered at the nearer stations (but not at the more distant), followed by a stronger shock which the distant stations took to be the only one. But this explanation clearly will not fit the present case. Errors in tables can scarcely be large enough to explain the difference: or abrupt enough, for the change comes sharply at Ann Arbor. Possibly the distance $\bar{\Delta}$ = 45° is significant. But we must await further light on the matter.

Coming now to the questions of epicentre and focal depth: suppose first we take the nearer stations by themselves. Let us adopt their own T_0 , viz., 18d. 15h. 29m. 34s., and group them in Azimuth, showing the correction to adopted Δ *without any correction for depth of focus*. There are two stations only near Azimuth 150° :—

	Δ	Az.	P. m. s.	S. m. s.	$\Delta(P)$	$\Delta(S)$	$\delta\Delta$
Rio de J.	$33^\circ 8'$	130°	5 50	10 26	$26^\circ 2'$	$26^\circ 2'$	$-7^\circ 6'$
La Paz	$14^\circ 3'$	169°	2 43	4 44	$10^\circ 9'$	$10^\circ 6'$	$-3^\circ 5'$

If we take T_0 from the distant stations, *i.e.*, increase all the times by 18s., we get $\delta\Delta = -6^\circ 2'$ for Rio, $-2^\circ 6'$ for La Paz, with naturally some difference between the indications for S and P in each case. To satisfy these two stations, *without any allowance for focal depth*, we must adopt an epicentre near $6^\circ\text{S. } 66^\circ\text{W.}$ with their own T_0 : $5^\circ\text{S. } 67^\circ\text{W.}$ with the earlier T_0 .

The remaining stations are in nearly the opposite azimuth, adopting the later T_0 appropriate to them :—

	Δ	Az.	$\delta\Delta$		Δ	Az.	$\delta\Delta$
Colim.	$38^\circ 3'$	307°	$-8^\circ 6'$	St. L.	$44^\circ 8'$	340°	$-7^\circ 7'$
Oax.	$32^\circ 1'$	310°	$-7^\circ 4'$	Georg.	$41^\circ 8'$	355°	$-7^\circ 5'$
Tacub.	$35^\circ 3'$	310°	$-6^\circ 9'$	Wash.	$41^\circ 8'$	355°	$-7^\circ 7'$
Mazat.	$43^\circ 0'$	311°	$-5^\circ 4'$	Chelt.	$41^\circ 6'$	356°	$-7^\circ 2'$
Pueb.	$34^\circ 3'$	312°	$-4^\circ 0'$	Ithaca	$45^\circ 2'$	356°	$-6^\circ 4'$
Merid.	$29^\circ 7'$	323°	$(-4^\circ 5')$	Port P.	$21^\circ 1'$	357°	$-3^\circ 6'$
Bal. H.	$14^\circ 3'$	324°	$-1^\circ 5'$	Ford.	$43^\circ 5'$	358°	$-7^\circ 5'$
				Vieq.	$21^\circ 4'$	15°	$-3^\circ 2'$

We have here an arc of 70° (from 307° to 375°) including the opposites of both Rio and La Paz, consistently requiring the epicentre to be nearer them. Moreover the demand clearly increases with Δ , as is the characteristic of allowance for focal depth. We cannot satisfy these observations by moving the epicentre: and we can satisfy them by the assumption of deep focus. Moreover the anticeutral stations in India show that [P] arrives very early at the antipodes. Among the anticeutral stations those in Japan have also been included, though, according to the suggestion of Tokyo and to the evidence of L and M at these stations, they belong probably to a separate shock at 15h. 43m. 20s. given below (Marianne Islands ($19^\circ 0'\text{N. } 144^\circ 0'\text{E.}$)). It will be seen that they fall in with the Indian readings for [P], which will themselves not accord with a Marianne Island shock, and consequently remain as evidence of a deep focus for the above shock, even when the Japanese readings are removed. If we increase T_0 by 10s, as suggested by the stations near the epicentre, we emphasise the early arrival of [P]. Altogether the evidence is strongly and consistently in favour of a very deep focus, and the curious discrepancy in the values of T_0 does not seem to affect the argument. Let us now return to the former shock and enquire whether any other solution or solutions are possible. There are 15 consistent stations in Azimuths 307° to 375° suggesting a considerable displacement of the epicentre. Grouping these in two lots and adding the European stations we have

No. Stns.	Mean Az.	$\delta\Delta$	Sin Az.	Cos Az.
7	314°	$-5^\circ 5'$	$= -\cdot 72x + \cdot 69y$	
8	356°	$-6^\circ 4'$	$= -\cdot 07x + 1\cdot 00y$	

—giving a solution $x = +1^\circ 7'$ $y = -6^\circ 3'$: indicating an epicentre at $3^\circ 8'\text{N. } 72^\circ 7'\text{W.}$, on the supposition of normal focus. From this epicentre $\Delta = 21^\circ$ for La Paz, and 40° for Rio de Janeiro. Moreover there are the European stations to be satisfied as follows :—

	Δ	Az.	$\delta\Delta$		Δ	Az.	$\delta\Delta$
Dyce	$81^\circ 0'$	30°	$-9^\circ 0'$	Besançon	$83^\circ 1'$	42°	$-9^\circ 8'$
Eskdalemuir	$79^\circ 7'$	33°	$-8^\circ 6'$	Zurich	$84^\circ 9'$	43°	$-10^\circ 3'$
Edinburgh	$80^\circ 0'$	33°	$-9^\circ 0'$	Moncalieri	$83^\circ 9'$	44°	$-10^\circ 9'$
Stonyhurst	$79^\circ 7'$	36°	$-8^\circ 7'$	Pola	$88^\circ 2'$	45°	$-10^\circ 2'$
Hamburg	$86^\circ 8'$	37°	$-11^\circ 0'$	Florence	$86^\circ 2'$	46°	$-9^\circ 9'$
Oxford	$79^\circ 7'$	37°	$-8^\circ 8'$	Marseilles	$81^\circ 9'$	46°	$-8^\circ 7'$
De Bilt	$83^\circ 6'$	38°	$-9^\circ 2'$	Tortosa	$77^\circ 9'$	48°	$-8^\circ 4'$
Uccle	$82^\circ 8'$	39°	$-9^\circ 6'$	Barcelona	$79^\circ 2'$	48°	$-8^\circ 6'$
Paris	$81^\circ 2'$	40°	$-8^\circ 4'$	San Fern.	$71^\circ 6'$	51°	$-7^\circ 1'$
Strasbourg	$84^\circ 5'$	41°	$-9^\circ 9'$	Granada	$73^\circ 8'$	51°	$-7^\circ 4'$
				Algiers	$78^\circ 9'$	52°	$-8^\circ 5'$

Dividing these into three groups of 7 stations (according to the azimuth) we get

Az.	$\delta \Delta$	Sin Az.	Cos Az.	Calculated.
35	-9.2°	$= +.57 x$	$+ .82 y$	$+1.0 -5.2^\circ = -4.2^\circ$
42	-9.9°	$= +.67 x$	$+ .74 y$	$+1.1 -4.7^\circ = -3.6^\circ$
49	-8.4°	$= +.75 x$	$+ .66 y$	$+1.3 -4.2^\circ = -2.9^\circ$

The separation in azimuth is not sufficient to enable us to calculate x and y separately, but we may first try the values $x = +1.7$ $y = -6.3$ found above, which give the results under the heading "calculated," clearly in complete disagreement with the observed $\delta \Delta$. If next we combine all three equations and take also the mean of the former two, making

$$\begin{aligned} -9.2^\circ &= +.66 x + .74 y \\ \text{and } -6.0^\circ &= -.40 x - .85 y \end{aligned}$$

the solution is $x = -4.0$ $y = -8.9$, indicating an epicentre at $6^\circ 4'N$. $67^\circ 0'W$. This solution, however, though it satisfies the mean of the former two equations (Azimuths 314° and 356°), gives the residuals -2.3 and $+2.2$ for them separately, which are too large to be admissible; and, of course, La Paz, Rio de Janeiro, and other stations would be in complete disagreement.

For several reasons, some of which will appear later, it seemed desirable to investigate thoroughly this case of suggested very deep focus, to see whether any possible alternative would present itself, but the answer seems to be satisfactorily in the negative.

Dec. 18d. 15h. 43m. 20s. Epicentre $19^\circ 0'N$. $144^\circ 0'E$. (as on 1919 Aug. 27d. 5h.).

$$\begin{aligned} A &= -.765, B = +.556, C = +.326; & D &= +.588, E = +.809; \\ G &= -.263, H = +.191, K = -.946. \end{aligned}$$

Many of the following readings have been entered also, chiefly as [P], for the preceding shock, as definite separation does not seem easy. See note to the previous shock.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^\circ$	$^\circ$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	17.1	348	4 11	+ 5	7 26	+ 6	9.0	10.3
Kobe	17.4	336	4 13	+ 3	—	—	—	8.0
Osaka	17.4	336	4 30	+20	—	—	—	5.7
Hukuoka	19.0	323	4 33	+ 4	—	—	—	—
Mizusawa	20.3	354	4 24	-21	7 0	-89	—	—
Taihoku	21.6	290	e 5 9	+ 9	—	—	—	—
Manila	22.5	262	e 5 5	- 5	—	—	—	29.3
Hakodate	22.9	354	e 3 44	?	—	—	—	—
Zi-ka-wei	23.7	305	e 4 50	-35	8 48	-50	—	27.3
Hong Kong	28.0	282	5 0	-68	—	—	29.0	29.2
Batavia	44.4	238	5 9	?	i 14 29	-34	21.7	—
Colombo	63.4	268	11 10	+36	—	—	17.7	25.7

Additional records : Kobe gives $MN = +9.4m$. Zi-ka-wei $PMZ_1 = +7m.29s$.
Batavia $iN = +5m.45s$, $SN? = +14m.9s$. Colombo $= +5m.16s$.

Dec. 18d. Readings also at 0h. (Tiflis), 3h. (Apia), 8h. (near Tokyo), 9h. (Taihoku), 12h. (Coimbra), 13h. (Berkeley and Apia), 15h. (Riverview, Zi-ka-wei, and Athens), 16h. (Tortosa, Strasbourg, Besançon, Algiers, Rocca di Papa (3), and Paris; these may be late phases of the 15h. earthquake), 17h. (Kodaikanal), 22h. (near Tokyo), 23h. (Zi-ka-wei, Kodaikanal, Eskdalemuir, Colombo, Hamburg, Uccle, De Bilt, and Helwan).

Dec. 19d. Readings at 0h. (Paris, Oxford, and Kew), 7h. (Manila), 11h. (near Mizusawa), 14h. (near Algiers), 18h. (Manila and Rio Tinto), 19h. (Tiflis and near Tokyo), 20h. (near Mostar), 23h. (Taihoku (2) and Zi-ka-wei).

Dec. 20d. 8h. 4m. 20s. Epicentre $37^{\circ}2'N$. $139^{\circ}0'E$. (as on 1919 April 15d.).

$$A = -.601, B = +.522, C = +.605.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tukubasan	1.3	0 15	- 5	—	—	0.3	0.4
Mito	1.5	0 16	- 7	—	—	0.4	0.5
Tokyo	1.7	e 0 28	+ 2	(0 49)	+ 1	0.8	—
Mizusawa	2.5	0 31	- 8	0 55	-14	—	—
Kyoto	3.4	e 2 16	?	—	—	3.4	3.6
Osaka	3.9	—	—	1 26	-21	2.6	2.8
Kobe	4.0	—	—	2 22	+32	3.0	3.1
Nagasaki	8.8	4 3	?S	(4 3)	+ 5	4.8	—
Zi-ka-wei	15.7	e 4 0	+12	e 7 9	+21	—	—

Additional readings : Tokyo gives also MN = +3.6m.
Kyoto MN = +3.7m. Kobe MN = +3.6m.

Osaka MN = +3.1m.

Dec. 20d. Readings also at 1h. (Vienna), 2h. (Batavia, Manila, Apia, Granada, Rocca di Papa (2), Riverview), 5h. (Riverview), 14h. (near Apia), 21h. (Tiflis), 22h. (Simla).

Dec. 21d. 10h. 14m. 45s. Epicentre $2^{\circ}0'N$. $20^{\circ}5'W$. (as on 1921 Jan. 23d.).

$$A = +.936, B = -.350, C = +.035; \quad D = -.350, E = -.937; \\ G = +.033, H = -.012, K = -.999.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Coimbra	39.8	15	—	—	—	—	19.8	—
Algiers	41.0	30	—	—	—	e 12.2	24.2	—
Rocca di Papa	49.7	33	i 8 57	- 8	—	e 29.0	—	—
La Paz	50.5	246	9 19	+ 9	16 17	- 8	23.2	26.0
Paris	50.8	19	—	—	—	e 30.2	—	—
De Bilt	54.5	20	—	—	—	e 26.2	—	—
Helwan	E. 56.4	55	15 9	?	—	—	—	39.8

Coimbra gives also e = +5m.55s.

Dec. 21d. Records also at 6h. (Apia), 7h. (Riverview and near Manila), 9h. (Apia and near Athens), 12h. (Rocca di Papa).

Dec. 22d. 20h. 42m. 50s. Epicentre $19^{\circ}3'N$. $62^{\circ}5'W$. (as on 1919 Aug. 30d.).

$$A = +.436, B = -.837, C = +.330; \quad D = -.887, E = -.462; \\ G = +.153, H = -.293, K = -.944.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Porto Rico	E. 3.0	249	0 53	+ 6	—	—	1.6	1.9
N. 3.0	249	0 42	- 5	—	—	—	—	2.1
Port au Prince	9.3	267	e 2 30	+10	(4 17)	+ 7	4.3	4.6
La Paz	36.2	189	—	—	e 13 2	-11	19.4	20.4
Victoria	56.5	316	—	—	—	—	29.8	35.2
De Bilt	E. 61.2	40	—	—	—	e 29.2	30.2	—
Rocca di Papa	66.4	51	i 10 40	-14	—	—	—	10.9
Helwan	E. 83.7	61	49 10	?L	—	—	(49.2)	—

Additional readings : Port au Prince gives also iP = +2m.35s. La Paz
P = 20h.40m.59s., T₀ = 20h.20m.18s.? De Bilt eLN = +30.2m.

Dec. 22d. Readings also at 0h. and 1h. (Manila), 2h. (Hong Kong and Batavia), 10h. (Wellington), 14h. (La Paz), 15h. (Helwan), 18h. (Riverview, Melbourne, and Wellington), 19h. (Helwan), 21h. (Manila and near Athens), 22h. (Algiers and near Athens.).

- Dec. 23d. Readings at 2h. (near Balboa Heights), 4h. (near Tokyo), 5h. (Taihoku and near Manila), 7h. (Riverview), 14h. (Batavia), 21h. (Taihoku).
- Dec. 24d. Readings at 1h. (near Athens), 10h. (Helwan), 22h. (La Paz).
- Dec. 25d. Readings at 1h. (Helwan), 6h. (Tiflis), 11h. (La Paz), 18h. (Taihoku).
- Dec. 26d. Readings at 2h. and 3h. (near Nagasaki), 7h. (Sydney and Riverview), 11h. (Batavia), 13h. (near Mizusawa and Tokyo), 14h. (La Paz), 15h. (near Mizusawa and Tokyo), 17h. (near Tokyo (2)), 18h. (La Paz), 20h. (Rocca di Papa, Pola, Athens, Belgrade, Sarajevo, and Pompeii), 22h. (Pola, Belgrade, Sarajevo, and Mostar), 23h. (Apia).
- Dec. 27d. Readings at 4h. (Manila and Taihoku), 16h. (Mizusawa), 17h. (near Tokyo and near Athens), 19h. (Manila), 22h. (Batavia and Manila).
- Dec. 28d. Readings at 1h., 3h. (2), and 4h. (La Paz), 6h. (near Belgrade), 8h. (Helwan, Tiflis, and near Athens), 11h. (near La Paz), 12h. (Manila and near Tokyo), 17h. (near Tokyo), 20h. (near Zurich), 22h. (La Paz), 23h. (near Tokyo and Mizusawa).
- Dec. 29d. Readings at 0h. (Batavia), 2h. (La Paz), 3h. and 6h. (Manila), 11h. (Colombo), 14h. (Taihoku), 16h. (Algiers and Colombo), 19h. (Batavia).
- Dec. 30d. Readings at 2h. (Zi-ka-wei), 7h. and 10h. (Manila), 12h. (La Paz), 23h. (Tacubaya).
- Dec. 31d. Readings at 0h. (Victoria and Honolulu), 3h. (Colombo), 4h. (Melbourne), 6h. (Sinj), 10h. (near Tacubaya), 14h. (La Paz).

BELATED READINGS FROM TIFLIS.

Some readings for 1921 and 1922 were received after 1921 Jan.-June had been printed off. In no case are they helpful. The best chance of help in revision is that of June 29d. 11h. 37m. 50s., for which an epicentre is assigned close to Tiflis ($\Delta = 1^{\circ}.4$): but the Tiflis readings are eP = 11h. 36m. 41s., M = 11h. 37m. 9s., *i.e.* both of them *before* the assigned T_p, for which the evidence is too strong to allow of modification by more than 1 min. There must be some error in the Tiflis readings, but without knowing its nature we cannot utilise the information. On Feb. 27 again an eP is given at 18h. 7m.; but this cannot refer to the shock at 18h. 23m. 28s., though a series of M's from 18h. 58m. to 19h. 58m. may do so.

TABLE.

De- grees.	P sec.	S sec.	S P sec.	De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.
1	15	28	13	51	553	991	438	101	855	1565	710
2	31	55	24	52	560	1004	444	102	860	1575	715
3	47	83	36	53	566	1016	450	103	865	1584	719
4	62	110	48	54	573	1029	456	104	870	1593	723
5	77	137	60	55	579	1041	462	105	874	1602	728
6	92	164	72	56	586	1054	468	106	879	1612	733
7	106	190	84	57	592	1066	474	107	884	1621	737
8	121	217	96	58	599	1079	480	108	888	1630	742
9	136	243	107	59	605	1091	486	109	893	1639	746
10	150	269	119	60	612	1103	491	110	897	1648	751
11	164	294	130	61	619	1116	497	111	902	1657	755
12	179	319	140	62	625	1128	503	112	907	1666	759
13	193	344	151	63	632	1141	509	113	911	1674	763
14	206	368	162	64	638	1153	515	114	916	1682	766
15	219	392	173	65	645	1165	520	115	920	1690	770
16	232	415	183	66	651	1177	526	116	925	1698	773
17	245	438	193	67	658	1190	532	117	929	1706	777
18	257	460	203	68	664	1202	538	118	934	1714	780
19	269	482	213	69	671	1214	543	119	938	1722	784
20	281	503	222	70	677	1226	549	120	942	1729	787
21	293	524	231	71	683	1238	555	121	947	1737	790
22	305	545	240	72	690	1250	560	122	952	1744	792
23	317	565	248	73	696	1262	566	123	957	1752	795
24	328	584	256	74	702	1274	572	124	961	1759	798
25	338	603	265	75	709	1286	577	125	966	1766	800
26	348	622	274	76	715	1297	582	126	970	1773	803
27	358	641	283	77	721	1309	588	127	974	1780	806
28	368	659	291	78	727	1320	593	128	978	1787	809
29	378	677	299	79	733	1332	599	129	983	1794	811
30	388	694	306	80	739	1343	604	130	988	1801	813
31	398	711	313	81	745	1355	610	131	992	1807	815
32	407	728	321	82	750	1366	616	132	996	1814	818
33	416	744	328	83	756	1377	621	133	1001	1821	820
34	425	760	335	84	762	1388	626	134	1005	1827	822
35	433	775	342	85	768	1399	631	135	1009	1833	824
36	442	790	348	86	773	1410	637	136	1014	1840	826
37	450	804	354	87	779	1421	642	137	1018	1846	828
38	458	818	360	88	785	1432	647	138	1023	1852	829
39	466	832	366	89	790	1443	653	139	1027	1858	831
40	475	847	372	90	796	1454	658	140	1031	1864	833
41	483	861	378	91	801	1464	663	141	1035	1869	834
42	491	875	384	92	807	1475	668	142	1039	1875	836
43	498	888	390	93	812	1485	673	143	1043	1881	838
44	506	902	396	94	818	1496	678	144	1047	1886	839
45	513	915	402	95	823	1506	683	145	1051	1892	841
46	520	928	408	96	829	1516	687	146	1055	1897	842
47	527	941	414	97	834	1526	692	147	1059	1902	843
48	534	954	420	98	840	1536	696	148	1063	1907	844
49	540	966	426	99	845	1546	701	149	1067	1912	845
50	547	979	432	100	851	1556	705	150	1071	1917	846



The International Seismological Summary for 1922 January, February, March.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number opens the fifth year of the Summary in its international form. The work of identifying the epicentres and times has been almost entirely done by Mr. J. S. Hughes, M.A., of New College, Oxford, whose salary has been provided as before, partly by the generosity of Dr. J. E. Crombie, of Dyce, Aberdeen, and partly by the Board of Scientific and Industrial Research. Miss E. F. Bellamy, Assistant in the University Observatory, Oxford, has collected the readings from the various Observatories on the cards, and arranged them under dates. The printing has been paid for by the International Funds.

The present number of the Summary deals with 68 epicentres, 32 of which are new and 36 repetitions from old epicentres. Corresponding figures are :

	New	Old	Ratio
1913-1920 March	597	550	1.09
1920 Apr.—Dec.	85	139	0.61
1921 Jan.—Dec.	104	149	0.70

The ratio of New Epicentres to Old is not perhaps decreasing so rapidly as might be expected.

The work of collation is still subject to delays from the tardy receipt of information.

Those observers who have not already communicated their readings for 1922 and 1923 are urgently requested to send them without delay to the University Observatory, Oxford.

There are five cases of suggested abnormal focal depth and one of height, viz. :—

	d.	h.				
Jan. 17	3	2.0S.	72.0W.	Depth	0.070	
Feb. 5	3	5.5S.	119.0E.	Height	0.040	
Mar. 4	13	52.5N.	157.5E.	Depth	0.030	
Mar. 6	21	52.5N.	157.5E.	„	0.030	
Mar. 10	16	22.0S.	180.0	„	0.060	
Mar. 28	3	21.0S.	67.0W.	„	0.010	

The evidence for the abnormality is shown by the figures, as well as being usually reviewed in a special note.

As we gain experience in this work attention is arrested at times by the curious differences in general precision with which earthquakes are recorded. Look, for instance, at the readings for Jan. 9d. 5h. 9m. 22s. : $24^{\circ}0'N$. $46^{\circ}0'W$. (Mid-Atlantic). The O—C for P and S is as follows :—

Limits.	Cases : P.	Cases : S.
s. s.		
over 30	2	4
+29 to +20	2	3
+19 to +10	7	4
+ 9 to 0	22	19
— 1 to —10	18	14
—11 to —20	0	4
—21 to —30	1	2
under —30	2	2

The concentration of the errors near 0 is really remarkable, considering the miscellaneous character of the instruments and the various possibilities of error.

Moreover, the L and M are almost equally consistent. We know that they fall near $\Delta/2$, when Δ is expressed in degrees and L and M in minutes. From the present earthquake the formulæ

$$L=0.480 \Delta + 0.3 \text{ min.}$$

$$M=0.516 \Delta + 0.5 \text{ min.}$$

give very good results. Does the constant 0.3min. represent the time taken to reach the surface from the focus? This would fit in with other evidence for the depth of focus.

On the other hand, Jan. 22d. 3h. 24m. 0s. $19^{\circ}0'S$. $177^{\circ}0'W$. may be taken as an example of poor and irregular observations. Of course, there are not many well-equipped observatories within 90° of the epicentre.

A general account of the procedure adopted in drawing up the Summary was given in the number for 1920 Jan.-Mar.; but the following particulars may be repeated for convenience of reference :—

Tables.—The adopted tables are those given by Zöppritz, and have been many times printed in condensed form in the Summary and its predecessors, *e.g.*, on the back of the last number for 1921. They were also printed in expanded form and distributed with the Summary. While admittedly requiring correction,

they are at least as good as others which have hitherto been suggested, as is shown in the discussion of the great Earthquake in China in 1920 Dec. 16; and it seems, in the interests of uniformity, undesirable to make a change until we are sure that it will be essentially nearer the truth. One reason for delay arises from the uncertainty as to average depth of focus, on which opinion is divided. Evidence has been presented in the Summary for presuming it to be about 0.03 or 0.04 of the earth's radius. See the discussion in the Summary for 1920 Jan. to Mar.

Constants for the Epicentre.—These are given so that Δ (the distance of any observing station) and Z (its azimuth from N., through E., S., W.) may be calculated from the formulæ

$$\begin{aligned} 2 \text{ versin } \Delta &= (a-A)^2 + (b-B)^2 + (c-C)^2 \\ 2 \sin \Delta \sin Z &= (a-D)^2 + (b-E)^2 + c^2 - 2 \\ 2 \sin \Delta \cos Z &= (a-G)^2 + (b-H)^2 + (c-K)^2 - 2 \end{aligned}$$

Here, if l, d are the longitude and latitude of the observing station, λ, δ of the epicentre

$$\begin{aligned} a &= \cos l \cos d, \quad b = \sin l \cos d, \quad c = \sin d \\ A &= \cos \lambda \cos \delta, \quad B = \sin \lambda \cos \delta, \quad C = \sin \delta; \quad D = \sin \lambda, \quad E = -\cos \lambda; \\ G &= \cos \lambda \sin \delta, \quad H = \sin \lambda \sin \delta, \quad K = -\cos \delta. \end{aligned}$$

The constants a, b, c were printed for a number of stations as Appendix III to the "Large Earthquakes of 1916," but this list has since been greatly extended in another circulated with the Summary about two years ago. Nearly 50 more stations have, however, since come in, and a supplementary list is issued with the present number of the Summary.

The azimuth Z is not wanted with great accuracy, so that the 2nd and 3rd formulæ of the above set are not often used, except near the epicentre, Z being read from a globe for the other stations.

T_0 , the time of the shock, is given in Greenwich solar time reckoned from midnight. *It is a great convenience in collating observations to have them all given in this form*, even for widely different longitudes. Some observatories (especially in Japan) have lately tended to revert to local time. They are urgently requested to consider the advantages of uniformity.

H. H. TURNER.

University Observatory, Oxford,
1925 Nov. 23.

1922 JANUARY, FEBRUARY, & MARCH.

Jan. 1d. 12h. 3m. 45s. Epicentre $3^{\circ}5S. 146^{\circ}5E$.A = $-.832$, B = $+.551$, C = $-.061$; D = $+.552$, E = $+.834$;G = $+.050$, H = $-.034$, K = $-.998$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	30.6	172	e 6 28	- 6	e 10 39	-65	e 11.2	18.3
Sydney	30.6	172	12 3	?S	(12 3)	+19	14.8	15.8
Manila	31.2	308	e 6 45	+ 5	—	—	—	—
Melbourne	34.3	181	—	—	c 10 39	-125	16.4	19.8
Batavia	39.6	265	e 7 51	0	—	—	—	—
Hong Kong	40.8	311	7 57	- 4	14 11	- 7	17.8	17.9
Zi-ka-wei	42.1	328	e 8 10	- 2	e 15 24	+48	—	—
Mizusawa	42.9	355	8 25	+ 8	14 55	+ 8	—	—
Colombo	67.3	279	12 15	+75	—	—	—	39.2
La Paz	140.4	124	19 46	[+ 6]	i 23 18	?PR ₁	—	—

Additional readings: Riverview gives also MN = $+21.7m.$, MZ = $+20.8m.$,
 T₀ = 12h.4m.55s. Melbourne eSR₁ = $+13m.27s.$ Batavia iE =
 $+8m.51s.$, i = $+10m.4s.$

1922. Jan. 1d. 19h. 46m. 15s. Epicentre $19^{\circ}0S. 177^{\circ}0W$.

(as on 1919 April 23d.).

A = $-.944$, B = $-.049$, C = $-.326$; D = $-.052$, E = $+.999$;G = $+.325$, H = $+.017$, K = $-.946$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ania	7.3	45	1 51	0	—	—	—	3.8
Christchurch	26.0	197	—	—	12 45	+143	16.0	18.8
Riverview	31.9	236	(i 6 52)	+ 6	i 12 13	+ 6	e 15.2	17.6
Sydney	31.9	236	7 45	+59	12 15	+ 8	16.8	18.4
Melbourne	38.5	232	7 33	- 9	13 48	+ 3	19.5	23.0
Honolulu	44.4	26	e 8 12	-17	i 14 44	-23	17.8	20.2
Perth	60.7	243	19 10	?S	(19 10)	+38	37.3	—
Tokyo	68.3	324	—	—	e 19 38	-28	e 39.2	—
Manila	69.7	294	e 12 15	+60	—	—	—	—
Osaka	70.2	320	11 32	+14	—	—	—	37.2
Batavia	74.9	269	i 11 58	+10	—	—	e 30.8	—
Berkeley	76.6	41	e 12 12	+13	—	—	e 34.7	36.2
z.	76.6	41	i 12 5	+ 6	—	—	e 35.0	—
Zi-ka-wei	77.5	310	e 14 45	?PR ₁	e 21 40	-15	—	—
Hong Kong	78.9	299	12 13	+ 1	21 50	-21	36.7	40.2
Victoria	82.7	33	16 4	?PR ₁	—	—	29.3	41.6
La Paz	101.6	112	18 49	?PR ₁	30 6	?SR ₁	48.7	60.0
Chicago	102.3	50	24 52	?S	(24 52)	-86	e 45.2	—
Colombo	104.7	272	23 45	?S	—	—	—	72.8
Ann Arbor	105.0	50	—	—	—	—	50.8	—
Kodaikanal	107.9	275	25 51	?S	(25 51)	-78	63.4	70.0
Toronto	108.4	49	—	—	e 30 15?	?	e 56.8	65.4
Georgetown	109.4	54	—	—	—	—	54.4	—
Washington	109.4	54	—	—	—	—	e 52.8	—
Ithaca	110.3	51	—	—	—	—	e 53.2	—
Northfield	113.3	49	—	—	—	—	e 58.8	—
Dyce	141.6	5	—	—	—	—	73.8	86.8
Edinburgh	143.0	6	—	—	75 25	?L	(75.4)	81.8
Eskdalemuir	143.3	6	—	—	—	—	65.6	79.4
Stonyhurst	144.9	6	—	—	76 15	?L	(76.2)	87.2
Hamburg	145.0	352	—	—	—	—	e 82.8	—
Bidston	145.3	6	—	—	—	—	—	95.0

Continued on next page.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		$^{\circ}$		m. s.	s.	m. s.	s.	m.	m.
De Bilt	E.	146.9	358	—	—	e 41 54	?SR ₁ e	72.8	78.3
	N.	146.9	358	—	—	e 42 55	?SR ₁ e	68.8	83.8
Oxford		147.1	4	—	—	—	—	76.2	88.2
Kew		147.5	4	—	—	—	—	—	96.8
Uccle		148.2	358	e 19 56	[+ 3]	e 30 39	?	e 47.8	83.8
Strasbourg		150.2	352	20 3	[+ 7]	—	—	e 74.2	86.7
Paris		150.3	1	—	—	—	—	e 74.8	88.8
Belgrade		150.4	335	e 19 47	[— 9]	e 32 17	?	e 83.6	—
Helwan		152.1	298	20 7	[+ 8]	—	—	—	91.8
Padova		152.6	346	20 29	[+ 29]	21 15	?	—	21.4
Pola		152.6	343	20 32	[+ 32]	—	—	—	100.3
Moncalieri		153.6	352	e 20 21	[+ 20]	—	—	61.1	86.6
Florence		154.3	346	20 14	[— 13]	—	—	—	89.8
Marseilles		155.6	357	—	—	—	—	e 79.8	—
Rocca di Papa		155.9	342	20 3	[— 0]	—	—	e 87.6	89.0
Coimbra		156.7	23	e 38 18	?	e 49 22	?	e 71.2	86.4
Barcelona		157.6	0	—	—	—	—	e 76.6	82.7
Tortosa	N.	158.2	5	—	—	—	—	e 79.8	98.6
Rio Tinto		159.5	22	43 45	?	—	—	—	97.8
San Fernando		160.8	23	—	—	—	—	78.0	85.6
Granada		161.0	16	e 20 23	[+ 14]	31 34	?	80.4	87.6

Additional readings and notes: Riverview gives also eP = -4m.33s., the true P is given as PR₁, iS = +12m.23s., PS = +12m.41s., MN = +16.4m., MZ = +18.5m., T₀ = 19h.41m.11s. Melbourne PR₁ = +9m.3s., SR₁ = +16m.33s., Honolulu MN = +22.0m., Perth PR₁ = +23m.10s., S = +27m.41s., SR₁ = +31m.14s., and +34m.34s. Osaka MN = +40.7m. Tokyo records S as e and gives eS = +25m.12s. Batavia i = +21m.25s., iE = +22m.52s. Berkeley iZ = +12m.44s. Chicago PR₁ = +27m.9s., S = +32m.50s. Ann Arbor reading is diminished by 1h. Toronto e = +34m.9s. Georgetown LN = +59.2m., LE = +63.8m. Washing- ton L = +63.8m. Ithaca L = +54.8m. and +59.8m. Dyce MN = +85.8m. De Bilt eE = +58m.45s. Strasbourg PN = +20m.6s., PE = +20m.15s., MN = +86.6m. Paris MN = +86.8m. Belgrade L = +91.5m. Marseilles LN = +85.8m. Rocca di Papa ePN = +20m.9s. San Fernando MN = +87.2m. Granada iP = +20m.32s., PR₁ = +25m.44s., and +26m.35s.

Jan. 1d. Readings also at 0h. (near Manila), 2h. (La Paz), 4h. (near Tokyo), 6h. (Vera Cruz and near Tacubaya), 9h. (Taihoku, Mizusawa, Zi-ka-wei (2), and Toronto) 11h. (near Taihoku (2) and near Balboa Heights), 16h. (Florence), 21h. (Sinj).

Jan. 2d. Readings at 2h. (La Paz), 4h. (near Athens), 6h. (Apia and near Balboa Heights), 19h. (Merida and Vera Cruz), 20h. (Oaxaca), 21h. (Tokyo, Taihoku, and La Paz)

Jan. 3d. 20h. 56m. 42s. Epicentre 15°-0S. 178°-0E.

A = -.965, B = +.034, C = -.259; D = +.035, E = +.999;
G = +.259, H = -.009, K = -.966.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$		m. s.	s.	m. s.	s.	m.	m.
Apia	10.0	79	—	—	—	—	—	6.3
Riverview	30.7	226	i 6 37	+ 2	—	—	e 14.7	18.7
Melbourne	37.0	225	(7 24?)	- 6	7 24?	?P	12.6	14.2
Manila	63.7	297	e 10 38	+ 2	(19 5)	- 4	19.1	—
Batavia	70.2	269	i 10 50	- 28	i 19 29	- 59	—	—
Hong Kong	72.8	300	11 33	- 2	20 48	- 12	—	—

Additional readings: Riverview gives also i = +9m.16s. and +15m.9s., MN = +20.9m. Melbourne SR₁? = +10m.6s. Batavia i = +14m.2s., iN = +19m.50s.

Jan. 3d. Readings also at 1h. (Stonyhurst and near Porto Rico and Port au Prince), 3h. (near Taihoku), 4h. (Zi-ka-wei), 8h. (Christchurch and Melbourne), 17h. (Zante), 20h. (Berkeley), 21h. (La Paz (2)), 23h. (Manila, La Paz (2), and near Batavia).

Jan. 4d. Readings at 0h. (Colombo, Melbourne, Kodaikanal, Hong Kong, and Manila), 6h. (near Tokyo, Mizusawa, and Nagoya), 9h. (Mizusawa), 13h. (Manila), 19h. (Manila and near Algiers).

Jan. 5d. Readings at 0h. (near Tacubaya), 5h. (La Paz), 9h. (Victoria, Honolulu, Berkeley, Ithaca, and Sitka), 13h. (Uccle), 18h. (Mizusawa), 19h. (Manila and La Paz), 23h. (Manila and Batavia).

1922. Jan. 6d. 14h. 10m. 36s. Epicentre 19°0S. 76°0W.

A = +.229, B = -.918, C = -.326; D = -.970, E = -.242;
G = -.079, H = +.316, K = -.946.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz		7.9	73	i 1 57	- 3	i 3 51	+17	4.0	4.7
Balboa Heights	N.	28.2	353	6 10	0	11 0	- 3	14.6	17.4
Porto Rico	E.	38.6	16	—	—	—	—	e 24.6	27.2
Oaxaca		41.5	331	6 59	-68	—	—	17.0	21.4
Vera Cruz		43.0	332	—	—	—	—	21.9	24.4
Tacubaya	E.	44.7	330	8 40	+ 9	—	—	18.9?	24.5
	N.	44.7	330	8 41	+10	—	—	18.7	24.1
Cheltenham	E.	57.8	359	—	—	18 3	+ 7	26.0	34.7
	N.	57.8	359	e 10 20	+22	17 43	-13	28.0	36.1
Georgetown	E.	58.0	359	10 7	+ 8	17 56	- 3	e 26.4	—
	N.	58.0	359	10 7	+ 8	17 55	- 4	35.5	—
Washington		58.0	359	9 59	0	17 48	-11	e 27.2	—
Fordham	E.	59.9	2	—	—	e 17 28	-54	39.4	—
Ithaca		61.5	0	e 10 28	+ 6	18 42	0	27.7	—
Chicago		61.7	351	10 32	+ 9	18 36	- 8	—	—
Ann Arbor		61.7	355	17 54?	?	19 18?	+34	27.9?	—
Toronto		62.7	358	—	—	19 54	+57	e 27.5	38.3
Northfield		63.3	3	—	—	—	—	e 35.4	—
Ottawa	E.	64.4	0	—	—	19 5	-13	e 25.4	—
Lick	N.	70.9	324	e 12 1	+39	—	—	e 36.4	—
Berkeley	E.	71.6	324	e 11 52	+25	e 21 40	+55	e 35.1	40.5
Victoria		79.6	330	13 26	+69	e 22 47?	+28	33.1	46.4
Cape Town		83.0	124	—	—	e 22 52	- 5	41.2	49.4
San Fernando		86.1	50	13 18	+24	23 24	- 7	39.2	50.9
Coimbra		86.3	45	12 55	0	22 58	-35	e 35.4	47.5
Rio Tinto		86.4	48	15 24	+149	—	—	—	53.4
Granada		88.2	50	i 13 4	- 2	i 24 13	+19	e 44.4	48.4
Honolulu	E.	89.8	293	—	—	24 9	- 3	41.9	44.1
	N.	89.8	293	—	—	24 39	+27	42.4	85.6
Apia		90.9	257	—	—	—	—	44.4	—
Wellington		91.0	225	e 14 0	+39	24 24	0	44.7	46.4
Tortosa	N.	92.7	47	13 34	+ 3	24 19	-23	e 44.4	53.1
Algiers		92.9	52	15 13?	+101	25 13	+29	46.4	53.4
Barcelona		94.0	47	—	—	e 24 14	-42	e 47.3	57.9
Bidston		95.6	36	20 41	?1R ₁	25 19	+ 7	—	59.7
Oxford		95.9	38	i 13 44	- 4	23 58	-77	39.4	51.5
Stonyhurst		96.1	36	e 15 6	+76	24 24	-53	50.4	60.4
Eskdalemuir		96.3	33	e 13 44	- 7	24 27	-52	37.4	59.0
Kew		96.3	38	24 24	?S	(24 24)	-55	—	56.4
Edinburgh		96.6	33	—	—	e 24 24	-58	49.4	54.1
Marseilles		96.9	46	—	—	e 39 24	?	e 50.4	—
Paris	E.	96.9	40	—	—	e 24 36	-49	49.4	53.4
Dyce	E.	97.6	31	e 15 29	+91	e 25 4	-28	—	51.3
	N.	97.6	31	—	—	e 25 1	-28	40.3	54.2
Uccle		98.7	39	e 13 49	-15	e 24 42	-61	e 42.4	56.5
Moncalieri		99.0	45	13 31	-34	24 48	-58	44.1	60.7
De Bilt		99.6	39	e 14 6	- 3	e 24 48	-64	e 42.4	58.0
Strasbourg		100.1	42	e 13 56	-15	—	—	e 48.4	53.4
Florence		101.1	47	35 24	?SR ₁	—	—	—	63.9
Rocca di Papa	E.	101.5	50	e 14 32	+14	24 48	-82	e 55.0	—
	N.	101.5	50	e 14 30	+12	—	—	e 55.9	—
Innsbruck	N.	102.1	44	e 14 18	- 3	—	—	e 52.4	—
Pompeii		102.6	51	—	—	—	—	56.1	—
Hamburg		102.8	38	e 14 12	-12	e 25 6	-76	e 40.4	59.8
Pola		103.2	46	14 24?	- 2	e 25 13	-73	53.9	61.0
Vienna		105.6	43	e 14 30	- 7	e 25 13	-95	e 51.4	59.3
Budapest		107.2	45	e 9 41	?	(e 28 10)	+67	e 28.2	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Belgrade	107.7	47	e 13 36	-71	e 22 58	?PR ₁	e 28.2	—
Upsala	108.1	32	—	—	e 25 25	-106	e 46.4	59.7
Konigsberg	109.2	37	—	—	i 25 27	-114	e 56.4	60.2
Riverview	110.6	221	e 15 29	-29	—	—	e 53.0	56.3
Sydney	110.6	221	20 30	?PR ₁	—	—	e 55.0	59.4
Melbourne	111.3	215	e 19 42	?PR ₁	—	—	i 29.7	31.6
Helwan	113.9	66	e 19 44	?PR ₁	—	—	e 58.4	66.5
Adelaide	116.8	211	—	—	e 30 54	?	e 59.0	63.9
Tokyo	144.4	306	—	—	—	—	e 68.3	—
Osaka	148.1	306	58 57	?L	—	—	(59.0)	75.9
Bombay	150.5	85	—	—	e 38 49	?SR ₁	—	—
Kodaikanal	152.8	105	e 34 54	?	—	—	49.4	100.0
Simla	152.9	58	e 38 48	?	—	—	—	77.9
Colombo	153.6	114	21 24	?	—	—	92.4	94.0
Batavia	154.6	187	e 20 7	[+ 5]	i 26 16	?PR ₁	e 79.3	83.8
Zi-ka-wei	160.1	311	e 34 21	?	e 45 15	?	—	—
Taihoku	162.7	294	—	—	—	—	e 77.6	—
Manila	163.2	257	e 23 54	?PR ₁	—	—	—	—
Hong Kong	169.9	291	22 9	?PR ₁	—	—	—	83.9

Additional readings and notes: Porto Rico gives also eLN = +24.1m., eE = +31m.34s. Washington gives also L = +33.9m. Ithaca L = +34.4m. and +45.4m. Ann Arbor LN = +33.9m. Toronto eL = +31.6m., +35.3m., +44.7m., and +79.6m. Ottawa LE = +28.4m. Berkeley eLN = +35.8m. Victoria PV = +12m.54s., MV = +47.4m. San Fernando MN = +51.4m. Coimbra eLN = +34.7m., MN = +47.6m. Honolulu eE = +30m.41s. Barcelona MN = +53.3m. Bidston alternative P = +21m.21s. Eskdalemuir PR = +17m.34s., MN = +42.6m. Paris eN = +24m.30s., MN = +61.4m. Dyce iE = +19m.44s. Uccle i = +26m.29s., MN = +45.0m. Moncalieri MN = +55.2m. De Bilt MN = -53.2m. Strasbourg MN = -56.0m. Florence readings increased by 1h. Hamburg MN = +59.6m. Pola MN = +61.9m. Upsala MN = +62.8m. Konigsberg iN = -26m.51s., eLZ = +58.8m., MZ = +65.4m. Riverview ePS? = +29m.58s., eSR₁ = +36m.6s. and +36m.42s., MZ = +55.6m. Sydney L = +35.9m. Adelaide eL = +37.9m., e = +57m.12s.

Jan. 6d. 19h. 20m. 38s. Epicentre 19° 0S. 76° 0W. (as at 14h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
La Paz	7.9	73	i 2 2	+ 2	3 34	0	3.9	4.1
Chicago	61.7	351	—	—	—	—	e 31.9	—
Victoria	79.6	330	—	—	—	—	41.8	46.3
Coimbra	86.3	45	e 12 56	+ 1	e 23 12	-21	e 37.4	—
Stonyhurst	96.1	36	e 49 52	?L	—	—	(e 49.9)	—
Kew	96.3	38	—	—	—	—	—	58.4
Edinburgh	96.6	33	50 22	?L	—	—	(50.4)	—
Paris	96.9	40	—	—	—	—	e 50.4	53.4
Uccle	98.7	39	—	—	e 25 52	+ 9	e 42.4	56.4
De Bilt	99.6	39	—	—	e 25 28	-24	e 48.4	57.9
N.	99.6	39	—	—	—	—	e 42.4	55.2
Hamburg	102.8	38	—	—	—	—	e 54.4	57.4
Pola	103.2	46	—	—	—	—	e 46.4	—
Melbourne	111.3	215	—	—	—	—	e 49.5	61.6
Helwan	113.9	66	—	—	—	—	e 58.6	67.4
Perth	127.8	194	—	—	—	—	74.4	—
Colombo	153.6	114	84 52	?L	—	—	(84.9)	87.4

Additional readings: Chicago L = +36.4m. Eskdalemuir (Δ = 96° 3) gives simply 20h. to 21h.

Jan. 6d. Readings also at 4h. (near Nagoya, Osaka, and Kobe), 5h. (near Sarajevo and Belgrade (2)), 12h. (near Tokyo, Mizusawa, and Nagoya), 13h. (Tiflis and near Tokyo), 15h. (Melbourne and near La Paz), 16h. (Batavia and Azores), 19h. (La Paz), 20h. (Hamburg and Victoria), 22h. (near La Paz).

Jan. 7d. 9h. 20m. 12s. Epicentre $6^{\circ}7'N$. $128^{\circ}3'E$.

$A = -.616$, $B = +.779$, $C = +.117$; $D = +.785$, $E = +.620$;
 $G = -.072$, $H = +.092$, $K = -.993$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	10.7	318	e 2 45	+ 5	—	—	6.2	7.3
Taihoku	19.4	341	—	—	e 8 7	- 3	—	—
Hong Kong	20.7	320	—	—	—	—	—	12.6
Batavia	25.0	239	5 38	0	—	—	i 12.4	—
Zi-ka-wei	25.3	346	5 37	- 4	e 10 0	- 9	—	16.0
Riverview	46.0	152	—	—	e 15 24	- 4	e 30.2	35.1
Melbourne	47.1	162	—	—	e 16 42	+60	e 19.8	37.3
Kodaikanal	50.4	280	34 0	?L	—	—	(34.0)	—
De Bilt	104.0	328	—	—	—	—	e 53.8	65.4
Uccle	105.1	327	—	—	—	—	e 53.8	65.8
Eskdalemuir	116.2	334	—	—	—	—	e 49.8	—

Additional readings: Manila gives also MN = +6.5m. Batavia iN = +18m.17s. Riverview eSR₁? = +19m.0s. and +19m.11s., MN = +30.8m. De Bilt MN = +57.9m.

Jan. 7d. Readings also at 1h. (La Paz), 7h. (Adelaide), 8h. (Manila, Batavia, Hong Kong, and Zi-ka-wei), 10h. (Hong Kong and near Mizusawa), 18h (Azores), 20h. (Manila), 22h. (Oaxaca, Vera Cruz, and Tacubaya).

Jan. 8d. 1h. 57m. 0s. Epicentre $52^{\circ}5'N$. $158^{\circ}0'E$.

$A = -.564$, $B = +.228$, $C = +.793$; $D = +.375$, $E = +.927$;
 $G = -.736$, $H = +.297$, $K = -.609$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa E.	17.7	228	4 13	0	7 32	- 1	—	—
N.	17.7	228	4 12	- 1	7 34	+ 1	—	—
Osaka	24.0	231	4 57	-31	—	—	5.8	6.7
Hong Kong	44.9	242	20 5	?L	—	—	(20.1)	—
Chicago	70.0	46	—	—	—	—	e 35.5	—
Hamburg	70.6	340	—	—	—	—	e 40.0	—
Batavia	72.9	234	e 10 48	-47	i 20 54	- 7	—	—
De Bilt	72.9	343	—	—	—	—	e 40.0	42.8
Budapest	74.0	333	11 19	-23	—	—	41.6	—
Vienna	74.1	334	e 11 42	- 1	—	—	—	52.5
Uccle	74.3	343	e 11 45	+ 1	—	—	e 40.0	—
Strasbourg	75.8	340	e 12 0	+ 6	—	—	—	—
Innsbruck N.	76.2	337	i 11 57	+ 1	—	—	—	—
Pola	77.8	335	—	—	—	—	e 38.0	—
Rocca di Papa	81.0	334	—	—	—	—	51.1	58.6

Additional readings: De Bilt gives also MN = +48.9m. Vienna iP = +11m.44s.

Jan. 8d. 23h. 49m. 0s. Epicentre $33^{\circ}0'N$. $142^{\circ}0'E$.

$A = -.661$, $B = +.516$, $C = +.545$; $D = +.616$, $E = +.788$;
 $G = -.429$, $H = +.335$, $K = -.839$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	3.2	325	i 0 59	+ 9	e 1 45	+17 (e 1.8)	—	2.0
Nagoya	4.7	299	0 59	-14	—	—	1.6	2.2
Osaka	5.7	290	1 29	+ 1	—	—	2.2	2.9
Kobe	6.0	289	e 1 27	- 5	—	—	2.4	3.7
Mizusawa	6.1	354	1 29	- 4	—	—	—	—

Additional readings: Nagoya gives also MN = +1.9m. Osaka MN = +3.0m. Mizusawa PN = +1m.54s.

Jan. 8d. Readings also at 2h. (near La Paz), 13h. (La Paz and near Balboa Heights), 17h. (Simla), 19h. (La Paz), 20h. (Azores and Simla).

1922. Jan. 9d. 5h. 9m. 22s. Epicentre 24°-0N. 46°-0W.

A = +.635, B = -.657, C = +.407; D = -.719, E = -.695;
G = +.283, H = -.292, K = -.914.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Porto Rico	E.	19-0	256	—	—	—	—	e 9-3	9-4
	N.	19-0	256	i 4 48	+19	8 29	+27	9-8	10-2
Azores		22-1	47	—	—	—	—	—	10-1
Port au Prince	N.E.	25-1	263	e 5 52	+13	13 52	?L	20-2	—
Fordham	E.	28-7	313	e 6 15	0	—	—	—	12-6
Northfield		29-7	320	e 6 53	+28	—	—	14-3	—
Cheltenham	E.	30-0	307	6 23	-5	11 26	-8	14-4	15-3
	N.	30-0	307	6 30	+2	—	—	13-0	13-9
Georgetown		30-2	307	e 6 25	-5	11 43	+6	e 14-8	—
Washington		30-2	307	6 28	-2	11 38	+1	15-1	—
Ithaca		31-2	316	6 36	-4	11 57	+3	14-0	—
Ottawa	E.	32-2	320	6 46	-4	11 59	-12	e 14-1	—
Toronto		33-6	316	i 7 2	+1	i 12 8	-26	e 16-8	21-8
Coimbra	E.	35-4	53	7 9	-8	12 33	-28	16-1	16-9
Rio Tinto		36-1	59	9 38	?	—	—	—	24-6
San Fernando		36-2	61	7 23	-1	13 14	+1	17-0	23-2
Granada		38-4	60	i 7 39	-2	i 13 43	-1	i 18-6	20-1
Chicago		38-7	309	7 38	-6	13 38	-10	18-4	—
St. Louis		40-1	301	i 7 56	0	14 8?	0	16-8	18-3
Tortosa		42-1	54	8 7	-5	14 30	-6	18-4	21-9
Barcelona		43-4	54	8 15	-6	i 14 49	-5	e 20-3	22-5
Bidston		43-5	37	9 50	+88	16 20	+85	(18-1)	23-8
Algiers		43-7	60	i 8 17	-7	i 14 52	-6	20-6	26-0
West Bromwich		43-7	38	8 25	+1	14 38	-30	—	23-5
Oxford		43-8	40	8 16	-8	i 14 57	-2	18-5	23-3
Stonyhurst		44-0	37	i 8 32	+6	i 15 8	+6	22-6	24-1
Esksdalemuir	Z.	44-2	34	i 8 23	-4	i 15 7	+2	21-6	—
Kew		44-3	40	8 38	+10	—	—	—	32-6
Edinburgh		44-5	34	8 32	+2	15 12	+3	—	23-0
Paris		45-2	45	i 8 34	0	i 15 15	-3	20-6	22-6
Dyce	E.	45-6	31	i 8 33	-4	i 15 20	-2	19-0	22-1
	N.	45-6	31	i 8 38	+1	i 15 20	-2	19-0	21-0
La Paz	E.	45-9	211	e 8 43	+4	i 15 30	+3	22-5	25-9
	N.	45-9	211	i 8 38	-1	i 15 14	-13	21-5	25-1
Marscilles		46-0	52	8 53	+13	i 15 44	+16	22-1	26-6
Vera Cruz	E.	46-7	274	7 43	-62	—	—	20-0	24-6
	N.	46-7	274	7 38	-67	—	—	20-0	22-6
Uccle		46-9	42	8 44	-2	i 15 39	-1	20-6	23-0
Rio de Janeiro	N.	47-0	176	e 8 26	-21	15 38	-3	24-7	26-1
Besançon		47-1	47	8 49	+1	15 44	+2	21-6	—
De Bilt	E.	47-7	41	8 54	+2	15 50	0	e 21-6	23-8
	N.	47-7	41	—	—	15 53	+3	e 20-6	24-0
Moncalieri		47-9	50	9 1	+8	15 56	+3	23-0	27-5
Strasbourg		48-5	46	8 57	0	15 56	-4	e 21-6	24-9
Zurich		48-9	48	i 9 4	+5	i 16 8	+3	e 23-0	—
Tacubaya	E.	49-4	275	9 8	+5	15 54	-17	22-6	—
	N.	49-4	275	9 8	+5	15 59	-12	22-3	—
Florence		50-3	52	9 3	-6	16 28	+5	23-8	26-1
Innsbruck	N.E.	50-7	47	e 9 18	+7	i 16 35	-8	e 23-7	—
	N.W.	50-7	47	—	—	e 16 33	+6	e 24-1	27-7
Hamburg		50-9	39	i 9 16	+4	i 16 38	-8	e 23-6	27-9
Padova		50-9	50	9 29	+17	16 24	-6	23-6	28-6
Rocca di Papa		51-3	56	e 9 20	+5	i 16 44	+9	e 24-9	31-4
Pola		52-2	50	i 9 39	-18	i 17 12	+26	e 24-9	29-8
Pompeii		52-7	57	i 10 6	+42	17 56	+64	27-4	41-4
Vienna	E.	54-2	46	—	—	i 17 25	+14	e 25-6	33-3
	Z.	54-2	46	9 42	+8	i 17 26	+15	—	32-8
Budapest		55-9	48	i 9 28	-17	i 17 19	-14	25-6	—
Upsala	E.	56-2	33	9 59	-11	17 47	+9	e 26-9	28-8
	N.	56-2	33	—	—	17 48	+10	e 24-0	30-5
Belgrade		56-9	50	e 10 0	+9	e 18 6	+21	e 27-7	30-7
Konigsberg		57-2	39	i 10 2	+9	i 16 58	-51	26-6	28-6
Victoria		64-1	315	—	—	i 18 32	-42	29-0	35-9
Lick	N.	64-8	301	e 11 6	+22	—	—	e 30-2	—

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Berkeley	65.1	302	10 58	+12	20 3	+37	30.5	35.9
Tiflis	74.8	50	—	—	e 21 38	+14	35.6	—
Cape Town	84.3	131	—	—	e 24 0	+49	—	—
Honolulu	N. 99.9	298	—	—	—	—	e 42.6	—
Simla	102.5	47	—	—	—	—	e 53.6	62.2
Bombay	106.5	60	e 58 31	?L	—	—	(e 58.5)	—
Kodaikanal	114.9	66	29 20	?S	(29 20)	+71	63.7	69.8
Zi-ka-wei	123.5	12	e 34 36	?	—	—	—	—
Taihoku	129.5	14	—	—	—	—	e 60.6	—
Manila	139.3	19	22 28	?PR ₁	—	—	73.9	85.3
Batavia	148.4	61	e 18 54	[-59]	—	—	77.9	—
Riverview	162.1	233	—	—	e 34 1	?	e 69.1	78.7

Additional readings and notes: Azores gives also P = 4h.57m.30s. Ithaca
 PR₁ = +7m.33s., LN = +13.5m. Toronto iL = +19.8m., eL = +26.1m.,
 and +47.8m. Coimbra ePN = +7m.13s., MN = +18.4m., T₀ 5h.9m.43s.,
 San Fernando MN = +19.6m. Granada iP = +13m.7s., PR₁ = +9m.14s.,
 MN = +20.4m. Barcelona PR₁ = +9m.56s., PR₂ = +11m.13s., SR₁ =
 +18m.15s., MN = +22.4m. Paris eS = +15m.12s., MN = +24.6m. La
 Paz PR₁ = +10m.22s., SR₁N = +18m.25s., SR₁E = +18m.48s., T₀ =
 5h.9m.31s. Vera Cruz readings are given as at 4h. instead of 5h. Uccle
 PR₁ = +11m.23s., SR₁ = +19m.12s., MN = +21.5m., origin 33° 0'N. 57° 0'W.
 Moncalieri MN = +27.1m. Strasbourg MN = +25.3m., MZ = +25.2m.
 Hamburg iSR₁ = +21m.47s., eSR₁ = +22m.7s., MN = +25.5m. Pola
 MN = +31.2m. Vienna iZ = +9m.43s., iE = +17m.18s., iSN = +17m.24s.
 Belgrade iP = +10m.2s., PR₁E = +11m.25s., PR₁N = +11m.22s., iSN =
 +18m.5s. Konigsberg PR₁Z = +13m.37s., iE = +14m.45s., iSN =
 +16m.59s., SR₁ = +21m.41s., eLN = +24.3m. Berkeley PN = +11m.10s.
 MZ = +35.5m. Manila MN = +83.2m. Batavia eLN = +104.4m.
 Riverview MN = +79.0m.

Jan. 9d. Readings also at 6h. and 8h. (2) (Algiers), 14h. (near Tokyo), 19h. and
 23h. (La Paz).

Jan. 10d. 13h. 41m. 12s. Epicentre 24° 0'N. 123° 0'E. (as on 1921 July 25d.).

A = -498, B = +766, C = +407; D = +839, E = +545;
 G = -224, H = +341, K = -913.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku	1.7	308	0 26	0	—	—	0.8	0.9
Hokoto	3.2	262	1 50	?L	—	—	(1.8)	2.2
Zi-ka-wei	7.3	349	e 1 50	-1	e 3 14	-4	—	4.3
Hong Kong	8.3	260	1 33	-33	—	—	—	4.5
Manila	9.6	192	e 2 9	-15	—	—	4.3	4.6
Nagasaki	10.6	33	e 2 56	+18	—	—	e 5.6	—
Batavia	34.1	209	e 6 24	-42	—	—	—	—
Simla	41.0	290	—	—	—	—	e 22.1	22.8
Kodaikanal	45.5	261	26 48	?L	—	—	(26.8)	—
Riverview	63.7	154	—	—	—	—	e 38.0	40.1
Hamburg	83.4	327	—	—	—	—	e 50.8	—
Pola	85.7	319	—	—	—	—	e 45.8	—
De Bilt	N. 86.7	327	—	—	—	—	e 46.8	48.4
	N. 86.7	327	—	—	—	—	e 43.8	56.2
Dyce	N. 86.7	334	—	—	—	—	44.8	—
Strasbourg	87.4	323	—	—	—	—	e 46.8	—
Uccle	87.8	326	—	—	e 22 48	-62	e 43.8	47.8
Edinburgh	88.0	333	45 48	?L	—	—	(45.8)	56.3
Eskdalemuir	88.4	333	—	—	—	—	43.8	—
Stonyhurst	89.1	330	e 42 18	?L	—	—	(e 42.3)	51.8
Kew	89.6	329	—	—	—	—	—	57.8
Bidston	89.6	330	—	—	—	—	—	59.8
Oxford	90.0	329	—	—	—	—	41.8	58.2
Paris	90.0	326	—	—	—	—	e 47.8	57.8
Tortosa	N. 96.1	320	—	—	—	—	e 48.8	54.2
Coimbra	101.6	324	e 43 45	?L	e 48 48	?L	53.8	—
La Paz	167.1	56	20 12	[-1]	—	—	—	—

Additional readings: Zi-ka-wei gives also MN = +4.2m. Riverview
 MN = +44.2m.

Jan. 10d. Readings also at 0h. (La Paz), 2h. (Manila and near Taihoku), 5h. (near Nagasaki), 8h. (Tokyo, La Paz, and Manila), 10h. (La Paz), 19h. (near Belgrade), 23h. (near Athens).

Jan. 11d. Readings at 0h. (Azores), 16h. (near Athens), 19h. (Mizusawa and La Paz).

Jan. 12d. 10h. 42m. 0s. Epicentre $40^{\circ}0'N$. $20^{\circ}0'E$. (as on 1920 Dec. 18d.).

$$A = -.720, B = -.262, C = +.643; \quad D = -.342, E = -.940; \\ G = -.604, H = -.220, K = -.766.$$

Was there a shock about 1 minute earlier, as suggested by Sarajevo, Pompeii, Sinj, and Moncalieri?

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	Δ	\circ	m. s.	s.	m. s.	s.	m.	m.
Athens	3.6	123	e 1 0	+ 4	1 44	+ 5	i 1.9	2.3
Mostar	3.7	335	i 1 9	-11	i 2 9	+27	—	2.7
Sarajevo	4.1	344	e 0 0	-64	i 0 38	-75	—	1.1
Pompeii	4.2	281	e 0 12	-53	3 32	+97	8.0	—
Sinj	4.5	327	e 0 0	-70	0 50	-74	—	1.0
Belgrade	4.8	4	e 1 10	-4	i 2 27	+16	—	2.7
Rocca di Papa	E. 5.8	291	e 1 24	-6	2 48	+ 9	—	—
	N. 5.8	291	e 1 42	+12	2 42	+ 3	—	—
Pola	6.6	319	1 43	+ 2	i 3 8	+ 8	—	4.5
Budapest	7.5	355	1 24	-30	i 3 43	+19	—	—
Padova	8.0	315	3 22	?S	(3 22)	-15	—	8.0
Vienna	8.6	344	2 38	+28	4 50	+57	—	5.5
Innsbruck	9.6	322	e 2 11	-13	e 5 40	-82	e 7.6	—
Lemberg	10.2	15	e 2 30	-3	—	—	e 4.2	6.2
Moncalieri	10.3	303	e 1 14	-80	4 13	-24	6.1	8.0
Strasbourg	12.2	318	—	—	e 5 0	-24	7.0	—
De Bilt	15.8	325	—	—	—	—	e 9.0	—

Additional readings: Athens gives also $P = -1m.8s.$, $MN = -2.6m.$. Mostar $iP = +1m.25s.$, $MN = +2.2m.$. Sarajevo $iP = +13s.$ Are all the times 1 min. in error? Sinj $P = +0m.30s.$ Belgrade $iP = +1m.23s.$, $MN = +2.8m.$ Pola $MN = +4.1m.$ Padova $MN = +7.5m.$

Jan. 12d. Readings also at 15h. (Taihoku, Hong Kong, and Zi-ka-wei), 18h. (near Kobe, Osaka, and Nagoya).

Jan. 13d. Readings at 13h. (Manila), 17h. (Taihoku).

Jan. 14d. Readings at 0h. (near Pompeii), 3h. (2) and 5h. (near Tokyo), 6h. (Batavia), 8h. (La Paz), 9h. (Honolulu), 10h. (Colombo), 11h. (near Manila), 17h. (Strasbourg, Innsbruck, Moncalieri, and near Zurich), 19h. (Moncalieri and near Zurich), 20h. (Batavia and Manila), 21h. (De Bilt), 23h. (La Paz).

Jan. 15d. Readings at 0h. (Colombo), 3h. (Mizusawa), 6h. (Port au Prince), 9h., 12h., and 13h. (Taihoku).

Jan. 16d. Readings at 2h. (Colima, Innsbruck, Pola, and near Sarajevo and Sinj), 3h. (Stonyhurst and La Paz), 4h. (La Paz), 5h. (Manila), 14h. (La Paz), 16h. (Zi-ka-wei and near Athens), 17h. (Riverview and Manila), 20h. (near Athens), 23h. (Apia).

1922. Jan. 17d. 3h. 50m. 24s. Epicentre 2°0S. 72°0W.

A = +.309, B = -.950, C = -.035 ; D = -.951, E = -.309 ;
G = -.011, H = +.033, K = -.999.

A depth of focus 0.070 below normal is adopted in this solution. See note at end.

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			°	°	m. s.	s.	m. s.	s.	m.	m.
Balboa Hts.	E.	-1.5	13.3	326	3 18	+22	4 28	-46	5.7	6.2
	N.	-1.5	13.3	326	3 20	+24	4 32	-42	5.7	—
La Paz		-1.9	15.0	166	i 3 4	-10	i 5 28	-18	6.1	—
Port au Prince		-2.9	20.5	359	e 4 29	+17	5 12	-81	7.6	E 1
Porto Rico		-3.0	21.2	18	4 44	+25	(7 21)	-23	7.4	E 5
Oaxaca		-4.4	31.0	310	5 18	+24	11 0	+27	14.0	15.8
	Z.	-4.4	31.0	310	5 17	+23	10 58	+25	14.0	13.8
Vera Cruz		-4.5	31.8	315	4 16	-105	—	—	8.9	9.4
	Z.	-4.5	31.8	315	4 14	-107	—	—	—	8.3
Puebla		-4.5	33.2	312	6 6	-8	—	—	—	—
Tacubaya	E.	-4.7	34.2	310	6 15	-8	11 27	+1	15.0	15.0
	N.	-4.7	34.2	310	6 20	-3	11 27	+1	15.1	15.2
	Z.	-4.7	34.2	310	5 18	-5	11 18	-8	14.3	16.0
Rio de Janeiro		-4.5	34.9	130	i 6 0	-29	10 36	-60	14.1	14.3
Cheltenham	E.	-5.5	41.0	357	e 7 31	+13	—	—	16.3	16.7
	N.	-5.5	41.0	357	i 7 19	+1	—	—	13.1	16.7
Georgetown	E.	-5.5	41.2	356	e 7 13	-6	i 13 2	-4	e 17.0	18.1
	N.	-5.5	41.2	356	i 7 16	-3	i 13 4	-2	e 17.2	19.3
	Z.	-5.5	41.2	356	i 7 16	-3	13 1	-5	e 17.0	—
Washington		-5.5	41.2	356	7 15	-4	13 2	-4	17.4	19.6
Mazatlan		-5.5	41.9	310	7 25	0	14 1	+45	17.0	17.2
St. Louis		-5.7	44.0	340	i 7 39	-1	9 36	? PR ₁	10.9	13.7
Ithaca		-5.7	44.6	357	7 46	+1	13 49	-2	17.6	—
Ann Arbor		-5.8	45.5	350	8 12	+19	14 30	+27	17.5	16.0
Chicago		-5.9	46.0	346	7 58	+2	—	—	—	—
Toronto		-5.9	46.1	354	—	—	i 13 42	-28	e 24.0	—
Northfield		-5.9	46.2	0	7 58	+1	14 5	-3	—	—
Ottawa	N.	-6.0	47.5	358	8 6	-1	14 36	+8	e 21.3	—
Tucson	E.	-6.2	50.2	319	8 29	+3	—	—	17.1	17.4
Azores		-6.9	58.3	43	9 6	-10	—	—	—	—
Lick	E.	-7.0	60.5	318	e 9 36	+6	i 17 6	+13	—	—
	N.	-7.0	60.5	318	e 9 31	+1	e 17 12	+9	—	—
Saskatoon		-7.1	61.0	339	i 9 38	+6	i 17 23	+15	26.1	—
Berkeley	E.	-7.1	61.2	318	e 9 36	+2	i 17 19	+9	—	—
	N.	-7.1	61.2	318	e 9 37	+3	i 17 17	+7	—	—
	Z.	-7.1	61.2	318	e 9 33	-1	i 17 17	+7	—	—
Victoria		-7.5	67.1	327	i 10 15	+6	e 18 33	+15	—	19.2
	Z.	-7.5	67.1	327	10 16	+7	(18 26)	+8	18.4	18.7
Coimbra	N.	-7.8	71.5	46	i 10 39	+3	i 19 21	+12	30.8	31.2
San Fernando		-7.8	72.0	51	10 49	+10	(19 24)	+9	19.4	20.8
Rio Tinto		-7.8	72.0	49	12 36	? PR ₁	—	—	—	28.6
Accra		-7.8	72.1	84	17 36	?	—	—	—	30.8
Granada		-8.0	74.2	51	i 10 51	-2	i 19 46	+6	36.9	49.6
Sitka		-8.1	77.6	331	e 11 32	+18	i 20 27	+7	—	20.5
Tortosa	N.	-8.2	78.2	48	11 14	-3	i 20 29	+3	32.2	32.8
Bidston		-8.2	79.2	36	12 36	+73	16 36	? PR ₁	—	26.5
Algiers		-8.2	79.3	52	11 18	-6	i 20 42	+3	32.6?	39.1
Barcelona		-8.2	79.5	48	11 21	-4	i 20 45	+3	e 31.5	33.5
Stonyhurst		-8.2	79.5	36	i 11 18	-9	(20 24)	-21	20.4	21.8
Oxford		-8.2	79.5	38	i 11 25	-2	20 53	+8	—	—
Eskdalemuir		-8.2	79.5	33	i 11 25	-2	i 20 46	+1	—	—
Edinburgh		-8.2	80.0	33	11 39	+11	20 50	+2	—	20.9
Kew		-8.2	80.3	38	11 36	+5	—	—	—	20.6
Dyce	E.	-8.2	81.0	31	i 11 32	-3	i 20 57	-3	—	—
Puy de Dôme		-8.2	81.1	43	e 11 42	+7	21 19	+18	34.4	—
Paris		-8.3	81.4	40	e 11 33	-4	i 20 58	-5	28.6	29.6
Marseilles		-8.3	82.3	47	e 11 48	+6	21 20	+6	35.5	—
Uccle		-8.3	83.0	39	11 38	-9	21 7	-15	i 34.2	35.0
Besançon		-8.3	83.3	42	11 43	-6	21 26	0	32.6	—
De Bilt		-8.3	83.7	38	11 53	+2	i 21 29	-1	e 30.6	31.5
Moncalieri		-8.3	84.2	45	11 48	-6	21 18	-18	—	27.1
Strasbourg		-8.4	84.8	41	11 46	-11	i 21 38	-4	30.6	—
Zurich		-8.4	85.1	43	e 11 49	-10	i 21 27	-18	—	—
Florence		-8.5	86.5	46	11 56	-11	20 45	-75	—	42.9

Continued on next page.

	Corr. for Focus	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Hamburg		-8°5	86°9	37	i 11 58	-11	i 21 39	-26	e 31°5 45°9
Honolulu	E.	-8°5	87°0	292	12 1	-9	21 31	-35	e 41°5 42°4
	N.	-8°5	87°0	292	12 11	+1	21 36	-30	—
Innsbruck		-8°5	87°0	42	e 11 59	-11	i 21 34	-32	e 30°6 31°9
Padova		-8°5	87°1	44	12 23	+12	22 7	0	—
Rocca di Papa	E.	-8°5	87°4	48	—	—	e 21 36	-35	i 31°7 59°1
	N.	-8°5	87°4	48	—	—	e 22 6	-5	e 32°0 —
Pola		-8°5	88°4	45	e 12 16	-2	i 22 19	-3	e 30°3 32°3
Pompeii		-8°5	88°6	49	i 11 29	-51	20 54	-90	29°6
Cape Town		-8°6	89°2	56	i 12 11	-12	i 21 40	-50	—
Vienna	E.	-8°6	90°4	41	-12 24	-5	i 21 55	-49	e 37°4 50°9
	N.	-8°6	90°4	41	12 17	-12	21 51	-53	e 36°4 50°9
Mostar		-8°6	91°2	47	i 12 18	-16	i 26 6	? SR ₁	i 41°6 —
Upsala	E.	-8°6	91°6	150	e 12 19	-17	i 22 38	-19	— 45°4
	N.	-8°6	91°6	150	e 12 27	-9	i 22 36	-21	e 37°1 48°8
Budapest		-8°6	92°2	43	e 12 13	-27	i 21 40	-85	—
Konigsberg		-8°7	93°1	35	12 27	-17	22 11	-61	e 34°2 41°1
Belgrade		-8°7	93°2	45	e 12 35	-10	i 23 56	+42	i 30°8 —
Athens		-8°8	95°8	52	e 12 15	-44	22 17	-84	e 33°6 37°8
Apia		-9°0	99°0	258	15 22	+126	17 5	? PR ₁	— 22°6
Helwan		-9°1	102°5	61	13 9	-25	17 48	? PR ₁	— 31°9
Wellington		-9°2	105°8	226	e 13 36	-16	e 26 12	+50	e 57°1 —
Tiflis		—	111°1	43	e 11 36	?	—	—	19°6 —
Riverview		—	125°9	224	e 18 10	[-58]	e 21 58	? PR ₁	e 47°2 62°7
Sydney		—	125°9	224	14 16	-114	24 0	?	40°9 42°1
Melbourne		—	127°6	217	19 51	? PR ₁	30 12	?	52°2? 65°2
Mizusawa	E.	—	132°2	323	18 28	[-55]	21 4	? PR ₁	—
Adelaide		—	133°2	215	—	—	21 6	? PR ₁	e 38°2 —
Tokyo		—	135°3	321	e 19 12	[-21]	e 26 56	? PR ₁	e 37°0 40°8
Nagoya		—	137°3	323	18 34	[-61]	—	—	21°3 —
Osaka		—	138°5	324	18 53	[-44]	29 31	?	39°0 39°6
Kobe		—	138°7	324	18 40	[-57]	—	—	39°6 —
Simla	E.	—	138°8	40	18 36	[-62]	—	—	49°4 49°8
	N.	—	138°8	40	18 42	[-58]	—	—	47°8 49°0
Bombay		—	141°6	60	18 38	[-64]	—	—	46°6 —
Perth		—	145°3	192	(18 32)	-77	24 41	?	38°3 —
Zi-ka-wei		—	148°2	338	e 18 55	[-58]	e 28 8	?	e 41°8 47°4
Kodaikanal		—	148°5	74	18 36	[-77]	—	—	26°8 54°0
C Colombo		—	151°5	79	19 18	[-40]	23 6	? PR ₁	28°8 37°7
Calcutta		—	152°0	42	19 0	[-59]	27 36	?	36°2 —
Taihoku	N.	—	153°5	331	e 19 11	[-50]	e 23 50	?	e 29°0 —
Hong Kong		—	158°8	344	20 58	+51	28 39	?	43°8 44°1
Manila		—	162°1	315	e 19 13	[-56]	30 13	?	52°5 56°4
Batavia		—	171°7	172	19 15	[-61]	—	—	e 52°6 —

Additional readings and notes: Port au Prince gives also $iP = +4m.41s.$, $MN = +8.4m.$ Porto Rico $eE = +8m.15s.$, $MN = +8.6m.$ Georgetown $iE = +9m.9s.$ and $+10m.27s.$, $iZ = +9m.3s.$, $LZ = +28.6m.$ Mazatlan readings have been diminished by 19m. St. Louis $MN = +13.8m.$ Ann Arbor $SN = +14m.36s.$, $LE = +18.0m.$, $LN = +18.1m.$ and $+20.6m.$ Toronto $PR_1 = +9m.36s.$, $iL = +19.8m.$, $eL = +53.8m.$ +69.6m., and $+113.8m.$ Ottawa $PR_2N = +10m.8s.$, $T_0 = 3h.50m.17s.$ Lick $iPN = +9m.38s.$, $ePZ = +9m.40s.$, $iPZ = +9m.43s.$, $iPR_1Z = +11m.52s.$, $iPR_1EN = +11m.53s.$, $SR_1N = +21m.48s.$ and several other readings. Saskatoon $PR_1N = +12m.6s.$, $T_0 = 3h.50m.22s.$ Berkeley $iPR_1EN = +11m.55s.$, $iPR_1Z = +11m.52s.$, $iSR_1Z = +22m.3s.$, $iSR_1N = +22m.4s.$, $iSR_2E = +23m.33s.$, $iSR_2N = +23m.35s.$, and very many other readings. Victoria $eS = +11m.44s.$, $SZ = +12m.21s.$, $L = +16.7m.$, $eL = +72.0m.$ and $+119.6m.$ Coimbra $SR_1E = +23m.23s.$ and $+24m.39s.$, $T_0 = 3h.50m.22s.$ San Fernando $S = +15m.12s.$ ($?PR_1$), $MN = +20.4m.$ Granada $i = +11m.52s.$, $SR_1 = +25m.48s.$ The M is given as for a second shock, for which $eP = +41m.1s.$ Sitka $eE = +13m.23s.$ Tortosa $ePN = +36m.36s.$ Barcelona $PR_1 = +14m.44s.$, $PR_2 = +16m.44s.$, $? = +24m.47s.$, $SR_1 = +26m.31s.$, $SR_2 = +29m.45s.$, $MN = +33.6m.$, $PR_2 = +40m.38s.$ Stonyhurst $S = +13m.54s.$ Dyce $e?N = +4m.37s.$, $iN = +11m.27s.$ Puy de Dôme $e = +40m.33s.$ Paris $SR_1 = +25m.9s.$ Marseilles $PR_1 = +15m.17s.$, $SR_1 = +25m.32s.$, $e = +40m.32s.$ Uccle $iP = +11m.55s.$, $PR_1 = +15m.4s.$, $iS = +21m.19s.$, $MN = +36.1m.$ and five i 's. Origin $4^\circ 0'N. 65^\circ 0'W.$ De Bilt $eE = +21m.13s.$, $eN = +25m.35s.$, $MN = +31.2m.$ Moncalieri $MN = +34.0m.$ Strasbourg $e = +40m.8s.$ Zurich $iE = +11m.53s.$, $iN = +11m.59s.$ Origin $2^\circ 0'N. 78^\circ 0'W.$ Hamburg $iPR_1Z = +14m.25s.$ and $+15m.58s.$, $iPR_1N = +14m.37s.$, $iSR_1N = +26m.14s.$, $MZ = +42.8m.$ Honolulu $SR_1N = +26m.37s.$ Innsbruck $PR_1SE = +14m.9s.$, $SR_1NE = +25m.38s.$, $e = +37m.48s.$, $eNW = +40m.18s.$, and $+58m.30s.$, given

Notes continued on next page.

as separate shocks. Padova $PR_1 = +17m.50s.$, $SR_1 = +22m.26s.$. Rocca di Papa $i = +12m.5s.$, $e = +12m.28s.$. M is given as belonging to an independent shock, for which also $ePE = +58m.36s.$ and $ePN = +58m.54s.$ Pola $ePN = +12m.19s.$, $MN = +32.5m.$. Pompeii separate readings $P = +12m.36s.$ and $P = +63m.36s.$. Capetown $PR_1 = +15m.48s.$, $PR_2 = +17m.59s.$, $iSR_1 = +26m.14s.$. Vienna $ePZ = +12m.12s.$, $iPZ = +12m.14s.$, and sixteen other i 's. Mostar $PR_1 = +13m.48s.$, $PR_2 = +16m.0s.$, $PR_3 = +18m.42s.$, $SR_1 = +27m.18s.$, $SR_2 = +28m.24s.$. Upsala $iE = +21m.57s.$, $i = +26m.54s.$, $SR_1 = +28m.9s.$. Königsberg $iPEZ = +12m.42s.$, $PSZ = +22m.50s.$, $eLZ = +34.7m.$, $MN = +39.1m.$, $MZ = +48.1m.$, and several other readings. Belgrade $iP = +13m.38s.$, $PR_1 = +14m.43s.$, $PR_2 = +15m.18s.$, $PR_3 = +16m.3s.$, $PR_4 = +17m.26s.$, $PR_5 = +19m.35s.$, $SR_1 = +24m.34s.$, $SR_2 = +25m.25s.$. Athens $PR_1 = +15m.46s.$, $PR_2 = +16m.56s.$, $MN = +38.8m.$, $i = -23m.14s.$ and $-39m.33s.$, $T = 3h.50m.35s.$. Apia $MV = +17.3m.$, $MN = +23.6m.$. Helwan $PR_1 = +15m.36s.$. Riverview gives also $PR_1 = +20m.17s.$, $e = +29m.2s.$ and $+29m.14s.$, $eSR_1 = +33m.50s.$, $MZ = +63.3m.$, $MN = +64.5m.$. Sydney $SR_1 = +33m.36s.$. Melbourne $PR_1 = +23m.42s.$, $PR_2 = +25m.48s.$, $SR_1 = +36m.21s.$, $SR_2 = +40m.12s.$. Mizusawa $PN = +18m.29s.$, $SN = -21m.3s.$. Adelaide $e = +24m.36s.$, $eSR_1 = +32m.36s.$. Osaka $MN = +39.5m.$. Perth $[P]$ is given as $PR_1, SR_1 = +37m.45s.$. Zi-ka-wei $PR_1N = +21m.35s.$, $PR_1E = +21m.43s.$, $PR_2N = +22m.38s.$, $SR_1E = +31m.58s.$, $SR_1N = +32m.5s.$, $MN = +51.9m.$. Manila $MN = +53.8m.$. Batavia $i = +19m.46s.$, $+21m.18s.$, $+24m.35s.$, $+25m.26s.$, and $+29m.18s.$, $iE = +44m.49s.$

The evidence for the considerable focal depth ± 0.070 may be briefly summarised as follows: (a) Firstly, the adopted T_0 is clearly well supported by the majority of the stations, as we see from the smallness of the residuals of P and S . (b) There are 19 observations of $[P]$ near the antipodes consistently giving large negative residuals. In order of magnitude they are (in seconds) $+51, -3, -21, -40, -44, -50, -55, -56, -56, -57, -58, -58, -59, -61, -61, -62, -64, -77, -77$. The middle value is $-57s.$, and the mean is $-47s.$ if we include everything, and $-53s.$ if we omit the exceptional $+51$ sec. (for Hong Kong).

Omitting the stations nearest the epicentre (Balboa Heights to Rio de Janeiro), there are four good azimuth groups:—

No. Stations	Mean. Azim.	Δ	Focus. Corr.	Sin Az.	Cos Az.
4	314	-0.1	-7.2	-72 x	+69 y
5	341	+1.1	-6.5	-33 x	+95 y
6	357	-0.4	-5.7	-05 x	+1.00 y
7	48	0.0	-7.9	+74 x	+67 y

The distribution in Azimuth, however, is not extensive. These mean values represent it as over an arc of 94° only (though individual stations extend this to 120°). A glance at the coefficients of x and y in the 5th and 6th columns shows us first that there can be no large value of x , whether we accept the corrections for focus or not; secondly, that if we accept these corrections the value of y is also small, but if we reject them the value of y must be about $-28^\circ 3/3.31 = -8^\circ.6$. Even then we have considerable discrepancies between the inner and outer groups. And if we attempt to make this correction through y , (i.e. to move the epicentre $8^\circ.6$ further north) we should throw the stations near the epicentre into worse confusion. It must be admitted that their residuals are not very good at present, but if we take an epicentre at $6^\circ.0N. 72^\circ.0W.$, the distance from Rio de Janeiro for instance becomes about 42° , whereas the observations indicate 27° ; and the distance from La Paz becomes 23° , whereas the observation of P indicates about 12° .

Jan. 17d. Readings also at 3h. (Colombo), 10h. (Bidston), 11h. (Helwan and Bidston), 15h. (La Paz), 19h. (Manila and Tiflis).

Jan. 18d. Readings at 3h. (Algiers and La Paz), 5h. (La Paz), 12h. (Apia and Zi-ka-wei), 17h. (near Mizusawa).

Jan. 19d. 21h. 58m. 50s. Epicentre $7^{\circ}0'S$. $140^{\circ}0'E$. (as on 1917 July 27d.)

A = -760, B = +638, C = -122; D = +643, E = +766;
G = +093, H = -078, K = -093.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Adelaide	28.0	182	—	—	—	—	—	15.0
Manila	28.7	319	e 6 26	+11	11 18	+ 6	14.1	14.3
Riverview	28.8	161	e 6 9	- 7	i 11 6	- 7	e 12.4	18.6
Sydney	28.8	161	—	—	9 28	?	12.8	16.0
Melbourne	31.1	171	—	—	e 10 28	-85	14.2	17.6
Batavia	32.9	270	e 6 57	+ 1	—	—	i 16.3	—
Perth	33.6	219	—	—	12 20	-14	18.2	19.0
Taihoku	36.7	331	13 31	?S	(13 31)	+11	16.4	—
Zi-ka-wei	42.1	336	e 8 10	- 2	e 14 36	0	—	—
Tokyo	42.7	259	e 14 16	?S	(e 14 16)	-28	(e 19.4)	—
Christchurch	46.4	146	—	—	15 10	-23	22.6	33.8
Apia	47.8	102	—	—	—	—	19.2	—
Colombo	61.6	281	11 10	+47	23 10	?SR ₁	34.2	36.5
Kodaikanal	64.6	285	19 22	?S	(19 22)	+ 2	34.3	44.5
Honolulu	E. 67.0	63	19 28	?S	(19 28)	-22	32.7	34.2
	N. 67.0	63	19 18	?S	(19 18)	-32	32.5	38.7
Simla	71.0	308	—	—	e 22 10	+92	—	42.0
Bombay	71.0	293	21 15	?S	(21 15)	+37	—	—
Victoria	99.6	42	26 0	?S	(26 0)	+ 8	44.7	57.0
Berkeley	E. 100.4	52	—	—	e 32 17	?SR ₁	e 46.2	—
Helwan	109.7	299	e 19 25	?PR ₁	—	—	59.8	69.2
Capetown	111.4	229	—	—	—	—	—	61.2
Konigsberg	112.4	327	—	—	—	—	e 58.0	—
Hamburg	118.5	329	—	—	—	—	e 58.2	62.2
Pola	120.1	319	—	—	e 31 10	?SR ₁	—	—
De Bilt	121.7	329	—	—	e 42 22	?SR ₁	e 58.2	64.7
Dyce	121.8	336	—	—	—	—	—	71.2
Strasbourg	122.2	323	—	—	—	—	e 61.2	—
Uccle	122.9	328	e 32 16	?	e 42 46	?SR ₁	e 57.2	65.4
Eskdalemuir	123.6	334	—	—	31 10	?	—	—
Moncalieri	124.0	320	—	—	—	—	61.9	—
Stonyhurst	124.2	332	e 22 52	?PR ₁	—	—	—	69.7
Kew	124.8	330	—	—	—	—	—	72.2
Paris	125.0	326	—	—	—	—	61.2	64.2
Oxford	125.1	330	—	—	—	—	58.3	67.2
Chicago	125.5	42	—	—	—	—	61.3	—
Ann Arbor	127.8	39	—	—	—	—	66.2	—
Toronto	129.8	36	—	—	—	—	64.7	85.2
Tortosa	N. 130.6	320	—	—	—	—	e 67.2	—
Ottawa	E. 130.8	32	—	—	—	—	e 64.2	—
Georgetown	E. 133.9	40	—	—	—	—	77.6	—
Granada	135.3	317	—	—	—	—	e 79.2	83.2
Rio Tinto	136.9	320	70 10	?L	—	—	(70.2)	125.2
San Fernando	137.4	318	65 10	?L	—	—	(65.2)	117.2
La Paz	143.6	130	e 20 14	[+28]	—	—	69.7	82.0

Additional readings: Manila gives also MN = +14.2m. Riverview iS = +10m.36s., SR₁ = +11m.44s., MN = +15.6m., MZ = +17.4m. Melbourne SR₁ = +12m.4s., SR₂ = +12m.52s. Batavia iE = +8m.26s., iN = +14m.49s. Perth PR₁ = +8m.6s., SR₁ = +15m.20s. Tokyo gives S as eP and L as eS. Christchurch PR₁? = +10m.34s., SR₁ = +18m.52s. Colombo P = +19m.10s. (?PR₁). Honolulu SE = +26m.38s., SN = +26m.42s. De Bilt MN = +64.9m. Uccle MN = +65.2m. Paris MN = +62.2m. Chicago L = +64.5m. Toronto eL = +73.5m. and +127.4m. Ottawa LE = +78.7m. San Fernando MN = +117.7m. La Paz P = +20m.28s.

Jan. 19d. Readings also at 1h. (Batavia), 3h. (Batavia and Vera Cruz and Tacubaya), 6h. (Batavia and near Mizusawa), 13h. (Puy de Dôme), 16h. (Manila), 17h. (La Paz), 18h. (Stonyhurst, De Bilt, Helwan, Kodaikanal and Colombo).

Jan. 20d. 6h. 50m. 54s. Epicentre $6^{\circ}5S$. $166^{\circ}5E$.

A = -0.966 , B = $+0.232$, C = -0.113 ; D = $+0.233$, E = $+0.972$;
G = $+0.110$, H = -0.026 , K = -0.994 .

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	30.8	205	e 6 40	+ 4	e 11 55	+ 7	e 14.2	16.9
Sydney	30.8	205	10 6	?	13 18	?SR ₁	15.5	17.5
Melbourne	36.9	209	—	—	e 12 48	-34	16.4	18.4
Adelaide	38.3	281	—	—	e 11 30	-132	i 14.8	16.5
Manila	49.8	295	e 9 6	0	—	—	—	—
Perth	53.5	235	16 59	?S	(16 59)	- 4	30.9	—
Batavia	59.2	268	i 9 40	-26	—	—	—	17.5
La Paz	121.3	115	e 22 11	?PR ₁	—	—	—	—

Additional readings: Riverview gives also eS = $+12m.12s.$, MNZ = $+17.0m.$
Melbourne PR₁ = $+8m.24s.$, SR₁ = $+14m.6s.$ Adelaide e = $+30m.36s.$,
Perth PR₁ = $+19m.33s.$

Jan. 20d. Readings also at 1h. (La Paz), 2h. (Tucson), 4h. (Ithaca, Chicago, Washington, Berkeley, Victoria, Tacubaya, and near Tucson), 5h. (Riverview and Melbourne), 8h. (Tiflis), 17h. (Manila), 21h. (3) and 22h. (Tiflis), 23h. (La Paz).

Jan. 21d. Readings at 7h. (Mizusawa), 12h. (Tacubaya), 16h. (Fordham), 19h. (Zi-ka-wei, Simla, Manila, and Colombo).

Jan. 22d. 3h. 24m. 0s. Epicentre $19^{\circ}0S$. $177^{\circ}0W$. (as on 1922 Jan. 1d.).

A = -0.944 , B = -0.049 , C = -0.326 ; D = -0.052 , E = $+0.999$;
G = $+0.325$, H = $+0.017$, K = -0.946 .

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Wellington	23.3	196	e 8 12	?	i 11 12	?L	e 13.2	15.0
Christchurch	26.0	197	—	—	9 54	-28	15.8	21.7
Riverview	31.9	236	e 6 32	-14	e 11 50	-17	e 14.0	15.9
Sydney	31.9	236	7 36	+50	11 54	-13	16.5	18.5
Melbourne	38.5	232	7 6	-36	13 42	- 3	20.3	23.3
Adelaide	42.2	238	—	—	i 14 18	-20	e 20.5	25.5
Honolulu	E. 44.4	26	i 14 8	?S	(i 14 8)	-59	18.1	20.2
	N. 44.4	26	—	—	—	—	18.2	20.3
Perth	60.7	243	18 16	?S	(18 16)	-16	37.4	—
Tokyo	68.3	324	e 16 49	?	29 24	?L	(29.4)	—
Manila	69.7	294	e 11 32	+17	20 25	+ 3	32.2	—
Mizusawa	70.1	327	—	—	19 24	-63	(28.0)	—
Osaka	70.2	320	—	—	15 45	?	—	39.0
Kobe	70.3	320	—	—	—	—	—	34.5
Taihoku	74.2	306	—	—	e 20 0	-76	—	—
Batavia	74.9	269	i 11 38	-10	—	—	e 33.0	—
Ootomari	75.0	333	18 22	?	—	—	—	—
Berkeley	76.6	41	i 11 36	-23	e 21 42	- 2	e 33.9	—
Lick	76.8	42	—	—	—	—	e 30.0	—
Zi-ka-wei	77.5	310	e 11 0	-64	—	—	—	—
Victoria	82.7	33	22 7	?S	(22 7)	-47	33.9	42.9
Sitka	E. 83.6	22	—	—	—	—	36.8	46.0
La Paz	101.6	112	e 18 29	?PR ₁	28 54	?	48.3	50.3
Chicago	102.3	50	—	—	32 15	?SR ₁	47.0	—
Colombo	104.7	272	25 0	?S	(25 0)	-99	—	73.0
Ann Arbor	105.0	50	—	—	—	—	36.0?	—
Toronto	108.4	49	—	—	—	—	e 51.4	63.9
Georgetown	E. 109.4	54	—	—	—	—	e 52.0	—
Washington	109.4	54	—	—	—	—	e 53.5	—
Cheltenham	E. 109.5	54	—	—	—	—	e 53.2	56.9
	N. 109.5	54	—	—	e 53 59	?L	e 59.7	—
Ithaca	110.3	51	—	—	—	—	54.5	—

Continued on next page.

		Δ °	Az. °	P. m. s.	O=C. s.	S. m. s.	O=C. s.	L. m.	M. m.
Ottawa	E.	111.0	48	—	—	e 28 22	+45	e 51.0	—
Tiflis		138.0	312	—	—	—	—	e 72.0	—
Dyce	N.	141.6	5	—	—	—	—	—	72.0
Konigsberg		141.8	343	—	—	e 67 43	?L	e 73.6	79.7
Edinburgh		143.0	6	—	—	—	—	—	79.0
Eskdalemuir		143.3	6	—	—	—	—	71.0	—
Stonyhurst		144.9	6	e 36 0	?SR ₁	—	—	—	83.0
Hamburg		145.0	352	—	—	—	—	e 69.0	82.0
Bidston		145.3	6	66 9	?L	85 3	?	(66.2)	96.8
De Bilt	E.	146.9	358	e 47 0	?	e 59 48	?	e 71.0	85.7
	N.	146.9	358	—	—	—	—	e 67.0	83.1
Oxford		147.1	4	—	—	—	—	70.4	86.4
Uccle		148.2	358	e 41 0	?SR ₁	e 47 0	?	e 65.0	86.0
Budapest		148.7	339	19 17	[-37]	—	—	e 73.3	—
Vienna		149.0	343	19 31	[-23]	—	—	e 62.5	87.0
Strasbourg		150.2	352	e 19 5	[-51]	e 19 58	[+ 2]	79.0	81.0
Paris		150.3	1	—	—	e 57 0	?	76.0	81.0
Belgrade		150.4	335	e 19 20	[-36]	e 21 41	?	28.4	—
Innsbruck		150.9	348	e 19 49	[- 9]	—	—	—	—
Besançon		151.7	356	—	—	—	—	89.0	—
Helwan		152.1	298	19 57	[- 2]	—	—	74.0	91.0
Pola		152.6	343	—	—	—	—	—	160.5
Moncalieri		153.6	352	e 20 23	[+22]	35 14	?	47.4	98.7
Marseilles		155.6	357	—	—	—	—	e 80.0	—
Rocca di Papa		155.9	342	e 20 57	[+54]	—	—	e 87.8	98.9
Coimbra	E.	156.7	23	—	—	e 51 0	?	74.4	78.3
Barcelona		157.6	0	—	—	—	—	e 79.1	86.1
Tortosa	N.	158.2	5	—	—	—	—	e 72.0	83.8
Rio Tinto		159.5	22	65 0	?L	—	—	(65.0)	99.0
San Fernando		160.8	23	—	—	—	—	79.4	85.0
Granada		161.0	16	e 58 8	?	i 67 23	?	79.3	82.3
Algiers		162.3	0	—	—	—	—	85.0	92.0

Additional readings and notes: Christchurch gives also SR₁ = +12m.12s.
 Riverview PS = +12m.5s., eSR₁ = +13m.12s., MN = +15.2m., T₀ =
 3h.23m.49s. Melbourne PR₂ = +9m.12s., SR₁ = +16m.48s. Adelaide
 i = +18m.0s. Honolulu SE = +17m.10s., SN = +17m.17s. Perth PR₁ =
 +21m.0s., S = +25m.50s., SR₁ = +31m.0s., and +32m.54s. Osaka MN =
 +39.2m. Kobe MN = +39.2m. Berkeley eLN? = +31.1m. Vic-
 toria S = +26m.3s.? Toronto eL = +55.2m. Georgetown LE =
 +54.0m. and +63.0m. Washington L = +63.0m. Cheltenham eN
 = +56m.28s. Ottawa eSR₁E? = +34m.30s. Uccle e = +36m.0s.
 Vienna iZ = +19m.55s. Moncalieri MN = +84.9m. Marseilles eL =
 +91.0m. Rocca di Papa eP = +21m.2s. Coimbra eN = +48m.0s.,
 eLN = +73.0m. San Fernando MN = +86.0m. Granada MN =
 +88.4m.

Jan. 22d. 20h. 44m. 20s. Epicentre 19°·0S. 177°·0W. (as at 3h.).

		Δ °	Az. °	P. m. s.	O=C. s.	S. m. s.	O=C. s.	L. m.	M. m.
Apia		7.3	45	1 12	-39	—	—	—	4.2
Wellington		23.3	196	—	—	e 10 10	+39	e 13.7	14.7
Christchurch		26.0	197	—	—	12 4	+102	16.1	19.5
Riverview		31.9	236	e 6 26	-20	e 12 11	+ 4	e 15.7	17.2
Sydney		31.9	236	e 7 58	+70	e 12 10	+ 3	17.4	19.3
Adelaide		42.2	238	(e 10 40)	?PR ₁	e 14 52	+14	e 18.3	26.2
Honolulu	E.	44.4	26	14 30	?S	(14 30)	-37	18.3	19.7
	N.	44.4	26	14 27	?S	(14 27)	-40	18.5	20.5
Perth		60.7	243	18 15	?S	(18 15)	-17	34.3	—
Manila		69.7	294	e 12 35	+80	(20 9)	-13	20.2	—
Batavia		74.9	269	e 12 0	+12	e 21 18	- 7	e 39.1	—
Berkeley		76.6	41	i 11 54	- 5	—	—	e 34.3	—
Lick		76.8	42	12 48	+48	—	—	e 34.8	—
Zi-ka-wei		77.5	310	e 15 40	?PR ₁	—	—	—	—
Tucson		81.4	51	—	—	—	—	37.0	41.9
Victoria		82.7	33	23 18	?S	(23 18)	+24	36.7	42.4
La Paz		101.6	112	e 17 54	?	28 52	+161	50.0	55.7
Chicago		102.3	50	—	—	e 27 10	+52	47.7	—
Colombo		104.7	272	36 40	?	—	—	—	74.7
Toronto		108.4	49	—	—	—	—	e 54.4	63.6
Georgetown		109.4	54	—	—	—	—	54.0	—

Continued on next page.

		Δ °	Az. °	P. m. s.	O=C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Washington		109.4	54	—	—	—	—	e 53.7	—
Ottawa	E.	111.0	48	—	—	e 28 36	+59	58.2	—
Dyce	N.	141.6	5	—	—	—	—	—	90.7
Konigsberg		141.8	343	—	—	—	—	95.7	—
Hamburg		145.0	352	—	—	—	—	e 81.7	—
De Bilt	E.	146.9	358	—	—	e 59 40	?	e 75.7	86.1
	N.	146.9	358	—	—	e 62 40	?	e 77.7	84.7
Oxford		147.1	4	—	—	—	—	—	88.3
Uccle		148.2	358	—	—	e 46 40	?SR ₁	e 68.7	—
Vienna		149.0	343	19 53	[- 1]	—	—	—	—
Strasbourg		150.2	352	e 19 59	[+ 3]	e 46 47	?	81.7	—
Paris		150.3	1	—	—	—	—	e 79.7	88.7
Belgrade		150.4	335	e 14 59	?	e 26 8	?PR ₁	30.2	—
Helwan		152.1	298	20 9	[+10]	—	—	82.7	—
Pola		152.6	343	—	—	—	—	e 75.7	—
Rocca di Papa		155.9	342	—	—	(24 16)	?PR ₁	24.3	—
Coimbra		156.7	23	e 48 40	?	e 60 40	?	e 73.7	—
Tortosa	N.	158.2	5	—	—	—	—	e 76.7	93.7
Rio Tinto		159.5	22	78 40	?L	—	—	(78.7)	96.7
San Fernando		160.8	23	—	—	—	—	79.2	86.7
Granada		161.0	16	i 20 57	[+48]	i 32 30	?	e 79.7	87.6

Additional readings and notes: Apia gives also readings at +1m.50s. and +3m.13s. Wellington gives S as e and iS = +12m.22s. (?iL). Christchurch SR₁ = +14m.16s. Riverview PS = +12m.30s., MN = +19.4m., T₀ = 20h.43m.28s. Adelaide e = +22m.22s. Honolulu SE = +17m.26s. Perth PR₁ = +20m.40s., S = +25m.8s., SR₁ = +30m.3s. Batavia iE = +22m.6s. Berkeley eLN = +34.7m. La Paz L = +49.1m., T₀ = 20h.51m.14s. Ann Arbor Δ = 105.0 gives simply L = 21h.? Toronto L = +34.4m. Ottawa eE = +34m.55s. Strasbourg e = +20m.14s. and +47m.5s. Rocca di Papa L = +46m.46s. (?SR₁). San Fernando MN = +87.2m. Granada MN = +85.9m. All readings are increased by 1h.

Jan. 22d. 22h. 5m. 20s. Epicentre 37°·5N. 140°·0E.

A = -·608, B = +·510, C = +·609; D = +·643, E = +·766;
G = -·466, H = +·391, K = -·793.

		Δ °	Az. °	P. m. s.	O=C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mizusawa	E.	1.9	28	0 33	+ 4	0 53	0	—	—
	N.	1.9	28	0 32	+ 3	0 52	- 1	—	—
Tokyo		1.9	186	i 0 36	+ 7	i 0 57	+ 4	—	1.0
Nagoya		3.4	227	1 5	+12	—	—	1.9	3.0
Osaka		4.6	233	—	—	2 16	+10	3.6	4.3
Kobe		4.8	235	i 1 29	+15	—	—	2.9	3.5
Sapporo		5.7	10	4 43	?	—	—	5.6	—
Ootomari		9.4	12	1 27	-55	—	—	3.0	—
Nagasaki		9.6	243	2 28	+ 4	—	—	5.2	—
Zi-ka-wei		16.6	253	e 4 40	+40	—	—	—	—
Manila		28.5	221	e 6 29	+16	—	—	16.6	—
Batavia		53.5	222	e 9 26	- 4	i 16 58	- 5	—	—
Hamburg	Z.	79.2	332	i 12 11	- 3	—	—	—	—
Budapest		80.2	324	11 57	-23	—	—	—	—
Vienna	Z.	80.7	327	i 12 19	- 4	—	—	—	50.7
Belgrade		81.3	321	(11 57)	-30	—	—	12.0	—
De Bilt	E.	82.2	334	—	—	—	—	e 43.7	46.4
	N.	82.2	334	—	—	—	—	e 44.7	52.4
Innsbruck	N.E.	83.6	329	e 12 34	- 6	—	—	—	—
Strasbourg		84.1	330	e 12 34	- 9	—	—	—	—
Rocca di Papa		87.4	324	i 12 50	-11	16 16	?PR ₁	—	16.7
La Paz		147.5	57	i 19 49	[- 3]	—	—	—	20.4

Additional readings: Nagoya gives also MN = +2.8m. Osaka MN = +3.8m. Kobe MN = +3.3m. Belgrade gives P as L, also eP = +7m.23s. Strasbourg e = +12m.44s.

Jan. 22d. Readings also at 1h. (La Paz), 4h. (Kodaikanal and Belgrade), 6h. (Florence), 13h. (Apia), 14h. (La Paz, Batavia, Manila, and Colombo), 15h. (Manila, Tacubaya, Zi-ka-wei, Perth, La Paz, Sydney, Riverview, Adelaide, and Helwan), 21h. (Vienna, Budapest, Adelaide, Riverview, and Sydney), 23h. (La Paz).

Jan. 23d. 23h. 31m. 50s. Epicentre $37^{\circ}2'N$, $139^{\circ}0'E$. (as on 1912 Dec. 20d.).

$A = -601$, $B = +522$, $C = +605$.

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mizusawa	E.	2.5	0 34	-5	0 59	-10	—	—
Nagoya		2.7	0 26	-16	—	—	—	—
Osaka		3.9	1 7	+6	(1 57)	+10	2.0	2.6
Kobe		4.0	e 1 13	+11	(2 9)	+19	2.2	2.5

Additional readings: Mizusawa gives also $PN = +33s$. Kobe $MN = +3.0m$.

Jan. 23d. Readings also at 3h. (Batavia, Manila, Riverview, and La Paz), 7h. (Taihoku), 14h. (Kodaikanal), 16h. (Algiers, Vienna, Batavia, Manila, and near Helwan), 20h. (La Paz), 21h. (Stonyhurst and Kodaikanal), 23h. (La Paz).

Jan. 24d. 13h. 3m. 6s. Epicentre $51^{\circ}0'N$, $141^{\circ}0'E$.

$A = -489$, $B = +396$, $C = +777$; $D = +629$, $E = +777$;
 $G = -604$, $H = +489$, $K = -629$.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mizusawa	E.	11.9	179	2 40	-18	5 10	-7	—	—
	N.	11.9	179	2 59	+1	5 19	+2	—	—
Zi-ka-wei		24.5	224	—	—	e 9 54	0	—	—
Konigsberg		63.2	326	—	—	—	—	e 41.0	—
Vienna		70.0	324	11 5	-12	—	—	e 41.4	47.9
De Bilt	E.	70.4	333	—	—	—	—	e 40.9	45.0
	N.	70.4	333	—	—	—	—	e 38.9	48.7
Uccle		71.7	333	—	—	—	—	e 44.9	—
Pola		73.8	324	—	—	—	—	e 42.9	—

Konigsberg gives also $L = +41.4m$.

Jan. 24d. Readings also at 9h. (Azores), 10h. (near Tokyo), 12h. (La Paz), 13h. (near Zi-ka-wei), 15h. (Mizusawa), 16h. (La Paz), 19h. (Mizusawa), 20h. (Stonyhurst).

Jan. 25d. Readings at 2h. (Azores), 9h. (Melbourne), 14h. (Taihoku and Stonyhurst), 15h. (near La Paz).

Jan. 26d. 9h. 19m. 12s. (I) } Epicentre $43^{\circ}0'N$, $125^{\circ}0'W$. (as on 1919 Aug. 24d.).
9h. 31m. 12s. (II) }

$A = -420$, $B = -599$, $C = +682$; $D = -819$, $E = +574$;
 $G = -391$, $H = -559$, $K = -731$.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
I Victoria		5.5	12	1 33	+8	—	—	3.4	3.9
I	Z.	5.5	12	1 48	-23	—	—	3.8	3.8
II		5.5	12	1 21	-4	—	—	2.8	3.5
II	Z.	5.5	12	1 18	-7	—	—	3.3	3.3
I Berkeley	N.	5.5	157	—	—	e 2 24	-7	—	—
II	N.	5.5	157	—	—	—	—	i 5.0	—
I Lick	N.	6.5	155	e 1 28	-11	i 2 23	-34	i 3.4	—
II	N.	6.5	155	(e 1 51)	+12	—	—	i 3.5	—
I Tucson	E.	15.5	129	—	—	—	—	7.6	—
II	E.	15.5	129	i 3 51	+5	7 19	+35	8.9	15.7
II Sitka	E.	15.5	339	—	—	(6 55)	+11	6.9	7.5

Continued on next page.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
II Chicago	27.4	80	—	—	e 10 58	+10	(15.3)	—
II	27.4	80	—	—	—	—	14.6	—
II Ann Arbor	30.1	77	—	—	—	—	16.8	—
II Toronto	32.8	72	—	—	10 6	-135	e 19.0	22.0
II Vera Cruz	34.0	125	—	—	—	—	—	22.8
II Ottawa	34.9	69	e 7 18	+ 6	e 10 10	?	e 18.3	—
I Honolulu	E. 34.9	243	7 15	+ 3	—	—	15.2	16.6
II	E. 34.9	243	—	—	—	—	e 14.1	15.5
II Ithaca	35.1	74	—	—	—	—	19.6	—
II Georgetown	36.0	80	e 6 15	-67	—	—	20.2	—
II Washington	36.0	80	e 7 3	-19	—	—	19.6	—
II Cheltenham	36.2	80	e 10 27	?	—	—	19.8	23.1
II Northfield	37.3	70	—	—	e 12 48	-40	20.8	—
II Dyce	69.0	29	—	—	—	—	36.8	—
II Eskdalemuir	70.0	31	—	—	—	—	34.8	42.3
II Kew	74.1	32	—	—	—	—	—	46.8
II De Bilt	75.6	29	—	—	—	—	e 37.8	46.3
II Hamburg	76.0	26	—	—	—	—	e 29.8	—
II Uccle	76.4	30	—	—	—	—	—	46.8
II La Paz	79.1	125	12 27	+13	—	—	—	—
II Rio Tinto	81.8	45	36 48	?L	—	—	(36.8)	56.8
II Moncalieri	82.5	32	—	—	e 35 58	?	47.0	—
II Hong Kong	95.0	308	51 18	?L	—	—	(51.3)	—
II Simla	103.1	341	—	—	—	—	e 59.7	61.0

Additional readings: Berkeley I gives also eN = +2m.35s. Lick I iN = +3m.23s. Lick II iE = +4m.47s. and +5m.35s., ePN is given as eLN. Toronto II iL = +21.6m. Ottawa LE = +22.3m. Georgetown eLE = +10.8m., eLN = +10.4m., LN = +19.8m. Cheltenham MN = +20.8m. Dyce L = +43.8m. All readings increased by 1h. De Bilt MN = +45.0m.

Jan. 26d. Readings also at 7h. (Stonyhurst), 8h. (Hong Kong, Batavia, and Manila), 15h. (La Paz).

Jan. 27d. Readings at 6h. (La Paz and Rio de Janeiro), 10h. and 13h. (La Paz), 15h. (Rocca di Papa), 18h. (near Batavia (2)), 20h. (near Port au Prince).

Jan. 28d. Readings at 6h. (near Batavia), 10h. (Colombo, Helwan, and Innsbruck), 11h. (De Bilt), 15h. (Riverview and Melbourne), 16h. (Azores and Rio Tinto), 18h. (Tiflis), 19h. (Innsbruck, Helwan, De Bilt, Colombo, and Pola).

Jan. 29d. Readings at 4h. (Manila, Hong Kong, De Bilt, Zi-ka-wei, and Taihoku), 5h. (near Manila), 17h. (Tiflis and near Mizusawa), 21h. (Taihoku).

Jan. 30d. Readings at 9h. (La Paz), 10h. (near Marseilles), 11h. (Taihoku, Zi-ka-wei, and Hong Kong), 13h. (La Paz), 16h. (Melbourne), 17h. (Colombo and Riverview), 20h. (near La Paz).

1922. Jan. 31d. 13h. 17m. 18s. Epicentre 41°·1N. 126°·6W.

(as on 1918 July 15d.).

A = -·449, B = -·605, C = +·657; D = -·803, E = +·596;

G = -·392, H = -·528, K = -·754.

On 1918 July 15 it is noted that a position 40°·7N. 125°·0W. would suit the observations better, especially those in the Eastern States. A similar displacement of the epicentre (0·2 southwards and 1·2 eastwards) was inferred from the present material. Thus 40°·8N. 125°·2W. may be taken as an improved epicentre suiting both earthquakes.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Berkeley		4·6	134	i 1 3	- 8	i 2 15	+ 9	—	2·6
Lick		5·3	132	e 1 20	- 2	i 2 25	0	—	2·6
Victoria	Z.	7·7	17	0 42	-75	—	—	2·7	5·6
Tucson	E.	15·3	120	i 3 41	- 2	6 49	+10	7·4	—
Denver		16·5	88	2 42	-77	(7 42)	+35	7·7	9·7
Sitka	E.	16·9	343	i 4 12	+ 8	—	—	7·6	8·7
	N.	16·9	343	—	—	—	—	7·7	11·9
Saskatoon		18·0	46	i 4 0	-17	i 7 22	-18	—	11·1
Mazatlan		24·6	130	5 9	-25	9 52	- 3	12·2	15·5
	Z.	24·6	130	5 7	-27	9 54	- 1	12·6	15·5
St. Louis		27·8	83	i 5 54	-12	10 36	-19	12·4	18·2
Chicago		29·0	76	5 57	-21	10 49	-28	—	—
Colima		30·1	133	6 30	+ 1	11 20	-16	15·2	20·2
Ann Arbor	E.	31·7	73	5 48	-56	—	—	—	17·9
Tacubaya	E.	31·8	126	6 29	-16	11 38	-27	13·9	18·6
	N.	31·8	126	6 26	-19	11 34	-31	13·9	17·1
	Z.	31·8	126	6 30	-15	11 45	-20	—	20·1
Puebla		32·7	124	—	—	—	—	11·4	15·9
Honolulu		33·1	243	i 6 52	- 5	12 20	- 6	—	—
Vera Cruz	E.	33·9	122	6 6	-58	11 48	-51	16·7	22·0
	N.	33·9	122	6 6	-58	11 50	-49	16·7	22·0
	Z.	33·9	122	6 5	-59	11 46	-53	16·7	21·9
Toronto		34·5	70	i 7 12	+ 3	i 12 54	+ 6	i 18·2	22·6
Oaxaca		35·1	125	6 48	-26	12 24	-33	16·4	20·6
Ottawa		36·7	66	i 7 12	-16	i 12 53	-27	e 16·7	22·8
Ithaca		36·8	71	7 13	-15	12 55	-26	e 16·2	—
Georgetown	E.N.	37·5	76	i 7 18	-16	i 13 10	-21	e 18·7	21·0
	Z.	37·5	76	i 7 17	-17	e 13 18	-13	e 17·1	23·4
Washington		37·5	76	i 7 17	-17	i 13 5	-26	17·4	26·7
Cheltenham	E.	37·7	77	i 7 14	-22	i 13 2	-32	19·4	23·9
	N.	37·7	77	e 7 19	-17	—	—	17·4	—
Northfield		39·1	67	7 29	-18	13 32	-21	18·5	25·7
Fordham	E.	39·1	74	7 32	-15	13 26	-27	19·7	23·7
	N.	39·1	74	7 38	- 9	13 39	-14	19·7	—
Halifax		45·2	64	8 25	- 9	15 4	-14	e 21·5	23·8
Port au Prince		51·2	100	e 9 32	+18	—	—	30·9	36·0
Porto Rico	E.	56·6	95	9 55	+ 5	17 45	+ 4	29·2	30·6
	N.	56·6	95	—	—	17 58	+17	27·6	34·0
Ootomari		61·8	310	10 41	+17	19 17	+31	26·7	35·0
Mizusawa	E.	67·0	303	11 14	+16	20 17	+27	—	—
Apia		69·0	229	11 16	+ 5	20 33	+19	30·3	32·2
Tokyo		69·8	300	11 4	-12	20 21	- 3	30·5	39·4
Edinburgh		71·8	30	e 11 33	+ 5	20 58	+10	30·7	39·9
Dyce	E.	71·8	28	e 11 32	+ 4	20 52	+ 4	25·3	78·5
	N.	71·8	28	e 11 32	+ 4	20 42	- 6	28·9	42·7
Eskdalemuir		72·2	30	e 11 33	+ 2	i 20 59	+ 7	34·7	38·6
Azores		73·2	55	11 42	- 5	—	—	—	50·7
Osaka		73·3	301	12 49	+71	21 42	+36	30·2	41·2
Kobe		73·4	301	e 11 47	+ 9	(e 20 15)	-52	e 20·2	40·8
Bidston		73·7	31	12 48	+68	32 12	?L	(32·2)	41·7
Stonyhurst		73·7	30	11 36	- 4	20 54	-16	30·2	43·4
Upsala		74·8	18	11 51	+ 3	i 21 28	+ 4	e 32·6	37·4
West Bromwich		74·9	31	11 50	+ 2	i 21 24	- 1	—	—
Oxford		75·7	32	11 54	+ 1	21 32	- 2	27·6	41·7
Kew		76·3	31	22 42	?S	(22 42)	+61	—	43·7
De Bilt		77·8	28	12 11	+ 5	22 9	+11	e 34·7	40·2
Nagasaki		78·0	304	e 22 15	?S	(e 22 15)	+15	e 31·1	—
Hamburg		78·2	25	i 12 10	+ 2	i 22 8	+ 6	e 38·9	41·0
Uccle		78·6	29	e 12 11	- 0	i 22 12	+ 5	33·7	38·5

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz		78.9	124	i 12 15	+ 3	i 22 13	+ 2	i 36.2	58.6
Paris		79.5	31	e 12 19	+ 3	i 22 19	+ 1	33.7	36.7
Coimbra	E.	81.2	43	e 12 31	+ 5	21 30	-67	33.2	37.3
	N.	81.2	43	—	—	—	—	32.8	37.4
Strasbourg	E.	81.7	29	e 12 28	- 1	22 30	-13	e 37.7	42.7
	N.	81.7	29	e 12 32	+ 3	22 44	+ 1	—	46.2
	Z.	81.7	29	e 12 28	- 1	—	—	—	48.8
Puy de Dôme		82.2	33	12 32	+ 1	22 52	+ 4	38.7	—
Besançon		82.2	30	11 21?	-70	22 55	+ 7	33.7	—
Zurich		83.0	29	11 42?	-54	—	—	—	—
Rio Tinto		84.0	44	17 44	?PR ₁	—	—	—	49.7
Innsbruck		84.1	27	i 12 45	+ 2	i 23 7	- 2	e 39.7	44.2
Zi-ka-wei		84.3	309	e 12 48	+ 4	e 23 10	- 1	—	—
Moncalieri		84.7	31	12 26	-20	23 3	-13	34.8	45.2
Vienna		84.9	24	i 12 45	- 2	i 23 15	- 3	e 41.2	45.9
Tortosa		84.9	37	12 46	- 1	23 7	-11	34.9	49.8
Marseilles		85.2	33	e 12 42	- 7	e 23 42	+21	e 28.7	36.7
Barcelona		85.3	36	e 13 3	+13	e 23 17	- 5	e 32.1	42.4
Lemberg		85.5	18	e 12 46	- 5	e 23 18	- 7	e 43.0	47.4
San Fernando		85.2	44	13 16	+27	23 24	+ 3	34.9	47.5
Granada		86.0	43	i 12 54	+ 1	i 23 26	- 4	e 34.7	46.6
Budapest		86.3	22	i 12 51	- 4	i 23 28	- 5	29.1	—
Pola		87.0	27	e 12 51	- 8	e 23 46	+ 5	e 37.1	48.7
Florence		87.0	29	12 27	-32	22 58	-43	36.7	40.2
Taihoku		88.6	304	—	—	e 23 20	-39	36.9	—
Belgrade		89.2	22	e 13 27	+16	e 24 7	+ 2	e 34.4	—
Rocca di Papa		89.3	29	i 13 26	+14	i 24 0	- 6	e 40.1	58.2
Algiers		89.5	38	e 12 58	-15	23 45	-24	40.7	48.7
Pompeii		90.9	28	13 12	- 9	23 52	-31	40.7	—
Hong Kong		95.2	307	17 29	?PR ₁	25 2	- 6	40.7	53.0
Athens		96.5	23	e 13 6	-46	e 24 10	-71	e 38.0	48.3
Tiflis		96.9	6	—	—	e 27 42	+137	44.7	—
Wellington		98.3	220	—	—	i 25 24	-15	47.4	48.4
Rio de Janeiro		100.2	112	e 17 51	?	—	—	43.2	—
Christchurch		100.8	221	24 54	?S	(24 54)	-69	46.7	60.3
Simla	E.	104.5	340	e 26 12	-26	e 43 30	?	e 57.6	58.2
	N.	104.5	340	e 24 54	-104	—	?	e 56.0	56.8
Helwan		106.2	20	e 18 42	?PR ₁	—	—	—	60.7
Riverview		106.4	239	—	—	e 26 33	-23	e 43.8	45.0
Sydney		106.4	239	21 30	?	34 0	?SR ₁	53.2	56.0
Accra		112.5	60	27 42	?S	(27 42)	- 8	—	69.7
Melbourne		112.8	239	—	—	27 42	-10	55.3	64.7
Adelaide		115.4	245	—	—	e 25 42	-151	i 49.3	69.9
Bombay		117.4	339	e 41 7	?	—	—	—	59.9
Batavia		121.2	291	21 23	?PR ₁	—	—	63.4	—
Kodaikanal		124.1	332	36 18	?SR ₁	—	—	58.3	83.0
Colombo		126.3	327	21 18	?PR ₁	—	—	38.3	73.9
Perth		130.1	260	27 56	?	39 14	?	—	—
Capetown		151.6	87	—	—	—	—	73.0	80.0

Additional readings: Berkeley gives also iNEZ = +1m.13s., ePNEZ = +1m.20s., iPNEZ = +1m.23s., iZ = +1m.45s., ME = +15.5m., T₀ = 13h.17m.21s. Epicentre 41°8'N. 125°30'E. Lick ePEZ = +1m.21s., iPENZ = +1m.24s., iZ = +1m.33s., iEN = +1m.35s., iPZ = +1m.43s., iPEN = +1m.45s., iNEZ = +1m.53s., and +2m.1s., iNZ = +2m.15s., iN = +2m.21s., MN = +4.0m., T₀ = 13h.17m.21s. Epicentre 41°8'N. 125°30'E. Mazatlan and Colima readings have been diminished by 22m. Ann Arbor S = +5m.12s., L = +8.3m., ME = +17.0m., LN = +19.2m. Honolulu PR₁E = +7m.53s., PR₂N = +8m.2s., eE = +14m.21s., eN = +13m.52s., SR₁N = +14m.22s., SR₂E = +14m.52s. Toronto e = +12m.24s., iL? = +20.2m. Oaxaca LZ = +16.8m.?, MZ = +22.6m. Ottawa MN = +20.6m., T₀ = 13h.17m.19s. Georgetown MN = +21.3m., other phases as for E component. Cheltenham LN = +18.5m. Halifax SR₁E = +18m.29s., T₀ = 13h.17m.19s. Mizusawa SN = +20m.14s. Apia +28m.44s., +29m.32s., and MN = +33.2m. Eskdalemuir SR₁? = +26m.18s., SR₂? = +29m.8s. Osaka MN = +39.7m. Kobe MN = +31.5m. Upsala MN = +43.6m. W. Bromwich SE = +20m.42s. De Bilt MN = +38.9m. Hamburg SR₁Z = +27m.40s., SR₂ = +31m.12s., L = +35.5m., MN = +43.5m., MZ = +43.8m. Uccle PR₁ = +14m.35s., SR₁ = +27m.7s., MN = +43.8m. Epicentre 40°N. 127°W. La Paz i = +27m.20s., L = +38.2m., MN = +44.6m., T₀ = 13h.17m.32s. Paris MN = +38.7m. Strasbourg PR₁E = +16m.4s., SR₁E = +28m.4s. Zurich S-PN = 9m.53s., S-PE = 10m.28s. Innsbruck MNW = +49.2m. Zi-ka-wei SR₁N = +29m.10s. Moncalieri MN = +49.0m. Vienna SR₁N? = +28m.44s., SR₁E? = +28m.52s., MNZ =

Notes continued on next page.

+49.7m. and 8 i's. Marseilles e -13h.11m.45s. Barcelona PR₁ = +16m.39s., ? - -26m.26s. San Fernando MN = -48.5m. Granada MN = 44.2m. Pola MN = +51.3m. Florence S has been increased by 10m. Belgrade PR₁ = -16m.40s., -18m.21s., -23m.10s., SR₁ = -25m.6s. and +28m.22s., L = +55.5m. Algiers MN = +52.2m. Hong Kong +14m.33s. (O - C = 49s.). Athens eLN = 13m.41s. (O - C = -11s.), PR₂ = +17m.32s., i = +26m.24s., MN = +53.0m., T₀ = 13h.17m.15s. Wellington e = +24m.24s., iSR₁ = +32m.18s., eSR₂ = +36m.36s. Christchurch P = +27m.24s., +32m.54s., and +35m.36s. Riverview ePR₁ = +17m.41s., SR₁ = +34m.0s., and +34m.14s., MZ = +61.8m. Sydney PR₁ = +25m.12s., SR₁ = +38m.42s., SR₂ = +46m.54s. Accra gives its readings as on 30d. Melbourne PR₁ = +19m.42s., SR₁ = +35m.36s. Adelaide gives numerous e and i phases in addition, also iSR₁ = +36m.12s. Batavia i = +31m.36s., +37m.28s., and +39m.28s., eL = +51.4m., eLN = +72.4m. Perth PR₁ = +31m.42s., SR₁ = +45m.55s.

The following readings were not communicated to Oxford, but are taken from Father MacIlwaine's paper on this earthquake in Bull. Seism. Soc. of America, Vol. 13, No. 2 (June 1923).

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Santa Clara		5.2	134	i 1 14	- 6	i 1 59	-24	—	—
Spokane		9.2	42	i 2 19	-18	4 4	-39	4.2	4.9
Hawaii		32.6	237	6 49	- 4	12 7	-11	13.9	15.3
Halifax	E.	45.1	63	8 25	- 9	15 4	-12	e 21.5	23.8
Balboa Heights	E.	52.5	114	9 24	+ 1	16 42	- 8	—	28.2
	N.	52.5	114	9 26	+ 3	16 44	- 6	—	28.2
Sendai		67.6	302	12 13	+71	20 33	+36	—	36.7
Le Mans		79.2	33	e 11 58	-16	22 42	+28	36.1	46.7
Göttingen	N.E.	79.9	26	i 12 19	+ 1	i 22 26	+ 4	e 37.2	43.2
Potsdam		80.9	24	12 23	- 1	22 29	- 5	e 37.7	44.7
Jugenheim		81.0	28	i 12 28	+ 3	i 22 40	- 5	e 37.7	48.6
Lisbon		81.9	44	12 33	- 3	22 39	- 6	35.8	42.0
Nordlingen		82.4	27	12 37	+ 5	22 57	+ 7	38.1	48.0
Munich		83.4	27	12 41	+ 3	23 3	+ 2	e 39.6	44.8

Jan. 31d. Readings also at 0h. (La Paz), 2h. (Batavia), 13h. (Mizusawa), 15h. (La Paz, Batavia, and Granada), 17h. (Kingston), 18h. (Taihoku and near Athens), 23h. (near Mizusawa).

Feb. 1d. Readings at 0h. (near Taihoku), 4h. (near Tokyo), 13h. (Dehra Dun), 17h. (La Paz).

Feb. 2d. 2h. 51m. 30s. Epicentre 49° 0S. 132° 0W.

A = -439, B = -488, C = -755; D = -743, E = +669;

G = +505, H = +561, K = -656.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Wellington		37.5	261	—	—	—	—	e 16.7	19.5
Riverview		57.1	255	—	—	e 17 45	- 2	e 26.7	28.3
Melbourne		58.4	247	—	—	—	—	e 30.0	32.5
La Paz		60.6	81	i 10 19	+ 3	18 33	+ 2	28.8	—
Adelaide		63.1	246	—	—	e 19 30	+28	32.5	36.0
Honolulu	N.	74.1	335	—	—	—	—	e 37.2	—
Victoria		97.6	6	—	—	—	—	48.2	52.6
Eskdalemuir		148.7	59	—	—	—	—	68.5	—
Uccle		152.2	69	—	—	—	—	e 84.5	—
De Bilt		153.0	67	—	—	e 64 30	?	e 75.5	—

Additional readings: Riverview gives also e? = +3m.30s., e = +16m.10s., and +18m.10s., MN = +27.4m. Helwan (Δ = 157° 0) gives simply 4h.

Feb. 2d. Readings also at 1h. (Apia), 7h. (near Berkeley and Lick), 9h. (Bidston), 14h. (Strasbourg and Barcelona), 17h. (near La Paz), 22h. (near Granada and Malaga).

Feb. 3d. Readings at 10h. (near Mizusawa), 16h. (La Paz), 19h. (La Paz), 20h. (Algiers).

Feb. 4d. Readings at 4h. (Colombo), 6h. (Manila), 7h. (Taihoku), 13h. (near Osaka), 18h. and 20h. (La Paz), 23h. (near Tokyo).

Feb. 5d. 3h. 39m. 16s. Epicentre $5^{\circ}5S$, $119^{\circ}0E$.

$$A = -.483, B = +.871, C = -.096; \quad D = +.875, E = +.485; \\ G = +.046, H = -.084, K = -.995.$$

A height of focus 0.040 is assumed.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Batavia	+0.7	12.1	266	3 7	- 3	e 5 39	0	i 8.2	—
Manila	+1.6	20.2	6	5 6	+ 3	—	—	—	—
Adelaide	+3.0	34.6	151	e 5 14	-141	—	—	e 17.9	21.1
Zi-ka-wei	+3.1	36.8	5	e 7 57	+ 3	e 14 3	- 2	—	—
Melbourne	+3.3	40.0	147	8 20?	0	13 44	-68	18.9	25.8
Colombo	+3.4	41.0	287	13 44	?S	(13 44)	-83	—	18.7
Riverview	+3.4	41.1	139	e 13 35	?S	e 18 23	?SR ₁	e 21.2	23.2
Sydney	+3.4	41.1	139	8 26	- 4	—	—	19.9	24.7
Kodaikanal	+3.6	44.3	291	25 56	?L	—	—	(25.9)	—
De Bilt	+5.8	108.5	324	—	—	—	—	e 57.7	69.0
Uccle	+5.9	109.7	322	—	—	—	—	e 60.7	63.7
Eskdalemuir	—	112.4	329	—	—	—	—	56.7	—
Stonyhurst	—	112.5	325	e 29 44	?S	(e 29 44)	+114	—	82.2
La Paz	—	156.9	162	20 29	[+24]	—	—	83.7	—

Additional readings: Adelaide gives also $e = +11m.44s.$ and $+14m.56s.$
Riverview MN = $-28.2m.$ De Bilt MN = $+66.1m.$

Feb. 5d. 22h. 19m. 28s. Epicentre $36^{\circ}0N$, $134^{\circ}0E$. (as on 1919 July 27d.).

$$A = -.562, B = +.582, C = +.588.$$

	Δ	P.	O-C.	S.	O-C.	L.	M.
		m. s.	s.	m. s.	s.	m.	m.
Kobe	1.6	0 21	- 3	—	—	0.7	0.8
Osaka	1.8	0 28	0	—	—	0.9	1.0
Nagoya	2.5	0 52	+13	—	—	1.4	2.2
Tokyo	4.7	e 2 10	?S	(e 2 10)	+ 1	e 2.8	3.6

No additional readings.

Feb. 5d. Readings also at 0h. (Apia), 1h. (Berkeley, Lick, and near Osaka and Kobe), 3h. (La Paz), 4h. (La Paz and near Helwan), 5h. (Berkeley), 6h. (Lick), 8h. (Taihoku), 9h. (Riverview), 10h. (Victoria, Adelaide, and Melbourne), 11h. (Zi-ka-wei, De Bilt (2), Taihoku (2), and Hong Kong), 14h. (near Mizusawa), 16h. (Taihoku), 17h. (near Mizusawa).

Feb. 6d. Readings at 0h. and 2h. (near Taihoku), 5h. (Stonyhurst), 8h. (La Paz), 11h. (near Tokyo), 16h. (Manila), 21h. (La Paz).

Feb. 7d. Readings at 5h. (Batavia), 6h. (Zi-ka-wei and La Paz), 16h. (La Paz), 20h. (Stonyhurst), 22h. (near Tokyo and Mizusawa).

Feb. 8d. Readings at 13h. (Simla), 14h. (La Paz), 18h. (Taihoku).

Feb. 9d. 14h. 53m. 36s. Epicentre $33^{\circ}2'N$, $138^{\circ}0'E$. (as on 1921 Mar. 15d.).

$$A = -.622, B = +.560, C = +.548.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Nagoya	2.2	0 24	-10	(0 39)	-21	0.6	1.3
Osaka	2.6	0 30	-11	(0 49)	-23	0.8	1.8
Kobe	2.8	1 0 45	+ 1	(1 4)	-13	1.1	1.3
Tokyo	2.8	0 52	+ 8	e 1 29	+12	e 1.8	e 2.6
Mizusawa N.	6.4	1 33	- 5	2 55	0	—	—
Zi-ka-wei	14.2	e 3 19	-10	—	—	—	—

Additional readings: Kobe gives also MN = +1.2m. Tokyo MN = +2.8m.
Mizusawa SE = +3m.3s.

Feb. 9d. 23h. 48m. 30s. Epicentre $49^{\circ}0'N$, $144^{\circ}0'E$. (as on 1918 March 23d.).

$$A = -.531, B = +.386, C = +.755; \quad D = +.588, E = +.809; \\ G = -.611, H = +.444, K = -.656.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mizusawa E.	10.1	193	2 33	+ 2	4 22	-10	—	—
Tokyo	13.7	195	i 5 57	?S	(i 5 57)	- 4	(i 6.1)	6.1
Hamburg	70.4	334	—	—	—	e 43.5	—	—
Eskdalemuir	72.2	342	—	e 21 0	—	—	36.5	—
De Bilt E.	73.1	335	—	—	—	e 42.5	48.0	—
N.	73.1	335	—	—	—	e 41.5	45.0	—
Stonyhurst	73.3	340	26 0	?SR ₁	—	—	—	53.5
Bidston	73.9	340	—	—	—	—	—	49.5
Uccle	74.4	335	—	—	—	e 41.5	43.5	—
Zagreb	75.0	325	—	—	—	—	47.5	—
Strasbourg	75.4	332	—	—	—	e 42.5	—	—
Pola	76.6	327	—	—	—	e 47.5	—	—

Additional readings: Mizusawa gives also SN = +4m.28s. Helwan
($\Delta = 81^{\circ}0'$) gives simply 10d.0h.

Feb. 9d. Readings also at 7h. (Almeria and Wellington), 8h. (La Paz), 9h. (Kodaikanal (2)), 14h. (Azores), 15h. (Manila), 18h. (Oaxaca and Vera Cruz), 21h. (Azores).

Feb. 10d. 13h. 37m. 0s. Epicentre $38^{\circ}5'N$, $142^{\circ}5'E$. (as on 1920 Dec. 28d.).

$$A = -.621, B = +.476, C = +.623.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mizusawa E.	1.2	0 24	+ 6	0 45	+12	—	—
Tokyo	3.6	i 1 44	?S	(i 1 44)	+ 5	i 2.2	2.5
Nagoya	5.6	0 51	-36	—	—	2.0	2.6
Osaka	6.8	1 43	- 1	(2 39)	-26	2.6	3.9
Stonyhurst	82.8	16 30	?PR ₁	—	—	—	18.0

Additional readings: Mizusawa gives also PN = +0m.25s. Tokyo iS = +1m.54s.

Feb. 10d. Readings also at 1h. (La Paz), 3h. (Taihoku), 6h. (Zi-ka-wei), 12h. (Manila), 21h. (Stonyhurst).

Feb. 11d. Readings at 2h. (near La Paz), 3h. (Stonyhurst and near La Paz), 8h. (Tacubaya and Oaxaca), 12h. (Innsbruck), 13h. (Manila), 14h. (Manila and Taihoku), 22h. (near Tokyo).

Feb. 12d. Readings at 4h. and 7h. (La Paz), 14h. (near Mizusawa and Tokyo), 15h. (Bidston), 22h. (Nagoya and near Tokyo (2)), 23h. (near La Paz).

Feb. 13d. Readings at 0h. (near Mizusawa), 5h. (Tiflis), 11h. (La Paz), 17h. (De Bilt), 19h. (De Bilt, Edinburgh, Stonyhurst, Uccle, and La Paz), 20h. (La Paz), 22h. (Taihoku).

Feb. 14d. 1h. 6m. 45s. Epicentre $38^{\circ}0'N$. $136^{\circ}0'E$. (as on 1920 May 12d.).

A = -567, B = +547, C = +616; D = +695, E = +719; ;
G = -443, H = +428, K = -788.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Nagoya		2.9	166	0 33	-12	—	—	1.5	1.9
Tokyo		3.3	166	i 1 6	+14	1 24	-7	1.6	2.5
Osaka		3.4	188	0 39	-14	—	—	1.7	3.2
Kobe		3.4	192	e 2 4	+71	—	—	2.8	3.2
Mizusawa	E.	4.1	74	1 0	-4	1 48	-5	—	—
	N.	4.1	74	1 3	-1	1 51	-2	—	—

Additional readings: Nagoya readings increased by 1m. Osaka gives
MN = +2.0m. Kobe MN = +3.0m.

Feb. 14d. 12h. 8m. 30s. (I) Epicentre $65^{\circ}5'N$. $31^{\circ}5'W$.
12h. 23m. 24s. (II)

A = +354, B = -217, C = +910; D = -522, E = -853;
G = -776, H = -475, K = -415.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
i Dyce	N.	16.1	107	—	—	—	—	i 8.7	—
ii	N.	16.1	107	—	—	—	—	—	8.3
i Edinburgh		16.6	112	8 30	?L	—	—	(8.5)	—
ii		16.6	112	—	—	—	—	—	10.6
i Eskdalemuir		17.0	113	e 4 8	+3	—	—	8.0	9.9
ii		17.0	113	e 4 1	-1	—	—	7.6	9.3
ii Stonyhurst		18.4	115	—	—	—	—	—	10.6
i Bidston		18.5	117	9 8	?S	(9 8)	+77	(10.1)	12.3
ii		18.5	117	4 58	+35	9 27	?L	(9.4)	12.8
ii Kew		21.1	116	—	—	—	—	—	12.6
i De Bilt		22.7	108	—	—	—	—	e 11.5	14.8
ii		22.7	108	—	—	e 9 30	+11	e 11.6	14.9
i Uccle		23.4	111	e 5 24	+3	—	—	e 11.5	—
ii		23.4	111	e 5 30	+9	e 9 41	+8	e 10.6	—
i Hamburg		23.5	100	—	—	—	—	e 14.5	—
ii		23.5	100	—	—	—	—	—	16.6
ii Paris		24.3	117	—	—	—	—	e 12.6	—
ii Strasbourg		26.5	110	—	—	—	—	e 14.6	—
ii Besançon		27.0	114	—	—	e 10 30	-11	—	—
ii Vienna		30.1	100	—	—	—	—	e 16.2	18.6
i Tortosa	N.	30.6	128	6 24	-10	—	—	—	—
ii		30.6	128	6 25	-9	—	—	e 13.6	17.9
i Rio Tinto		31.3	140	15 30	?L	—	—	(15.5)	18.5
ii		31.3	140	15 36	?L	—	—	(15.6)	18.6
ii Florence		31.8	112	18 6	?L	—	—	(18.1)	—
ii Pola		32.0	107	—	—	10 36	?	—	—
i San Fernando		32.6	140	8 12	+79	—	—	—	—
ii Ithaca	N.	33.9	219	—	—	—	—	e 23.6	—
i Belgrade		34.7	98	—	—	—	—	e 14.0	—
ii		34.7	98	—	—	—	—	16.6	—
ii Washington		37.1	245	15 54	?SR,	22 21	?L	(22.4)	—
ii Chicago		38.9	261	15 13	?S,	(15 13)	+82	(19.3)	—
ii Berkeley		56.4	289	e 9 56	8	e 17 10	-29	e 19.9	—
ii La Paz		86.5	215	e 13 4	8	—	—	—	—

Additional readings: Eskdalemuir ii gives also MN = -10.1m. Bidston ii
P = +5m.37s. De Bilt ii MN = +15.1m. Belgrade i L = +14.4m.,
ii L = +20.0m. and +25.2m. Berkeley eLNZ = +20.2m.

Feb. 14d. 12h. 27m. 45s. Epicentre $26^{\circ}0'N$, $100^{\circ}0'W$.
 $A = -156$, $B = -885$, $C = +438$; $D = -985$, $E = +174$;
 $G = -076$, $H = -432$, $K = -899$.

Very rough.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mazatlan		6.4	246	—	—	—	—	2.5	—
Tacubaya	E.	6.6	174	1 48	+ 7	3 13	+13	3.5	5.0
	N.	6.6	174	1 48	+ 7	3 14	+14	4.6	6.4
Vera Cruz		7.6	151	1 45	-10	—	—	3.9	5.5
Oaxaca		9.4	161	2 26	+ 1	—	—	4.3	5.6

Mazatlan readings given as 17h.

Feb. 14d. 12h. 45m. 12s. Epicentre $13^{\circ}5'S$, $68^{\circ}5'E$.
 $A = +356$, $B = +905$, $C = -233$; $D = +930$, $E = -366$;
 $G = -086$, $H = -217$, $K = -972$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Colombo		23.3	29	10 24	?8	(10 24)	+53	11.8	12.7
Kodaikanal		25.3	21	10 36	?8	(10 36)	+27	14.4	16.0
Bombay		32.6	8	e 18 39	?L	—	—	(e 18.6)	—
Batavia		38.4	83	e 7 41	0	—	—	i 14.9	—
Calcutta		40.9	29	8 6	+ 4	14 6	-14	21.1	—
Capetown		49.6	236	8 18	-46	—	—	22.7	25.0
Helwan		56.2	322	e 9 48	+ 1	17 38	+ 2	34.8	36.8
Manila		59.0	63	e 10 27	+22	—	—	14.3	—
Zi-ka-wei		67.6	47	e 8 38	?	—	—	—	—
Melbourne		71.1	126	—	—	e 21 0	+21	36.8	40.3
Belgrade	E.	72.7	328	e 11 39	+ 5	e 18 16	?PR ₁	e 25.6	—
Pompeii		73.7	321	11 18	-22	21 18	+ 8	—	—
Budapest		75.2	328	11 38	-12	—	—	e 32.1	—
Rocca di Papa		75.4	321	e 11 42	- 9	—	—	—	12.3
Zagreb		75.8	326	e 11 54	0	—	—	32.8	—
Riverview		76.8	123	—	—	—	—	e 39.7	47.5
Sydney	E.	76.8	123	33 54	?	—	—	40.3	43.8
Vienna		77.1	329	11 49	-13	—	—	e 33.3	50.3
Florence		77.4	322	—	—	—	—	—	56.3
Innsbruck		79.2	325	(e 12 18)	+ 4	e 12 18	?P	—	—
Algiers		79.4	314	e 12 5	-10	e 21 37	-39	35.8	38.8
Moncalieri		80.2	321	e 11 20	-60	22 17	- 8	33.0	—
Strasbourg		82.0	325	e 12 48	+18	e 15 48?	?PR ₁	e 34.8	—
Besaçon		82.3	323	—	—	—	—	34.8	—
Tortosa	N.	82.9	317	12 40	+ 5	—	—	34.4	53.2
Hamburg		83.5	330	—	—	e 25 48	?	e 50.8	66.8
Granada		84.4	311	i 12 42	- 2	e 23 47	+35	e 40.2	54.0
Uccle		85.0	326	e 12 48	0	23 19	0	35.8	—
Paris		85.2	323	—	—	—	—	35.8	35.8
De Bilt		85.2	328	—	—	e 23 15	- 6	35.8	36.6
San Fernando		86.1	310	—	—	—	—	43.5	55.3
Rio Tinto		86.8	311	44 48	?L	—	—	(44.8)	58.8
Kew		87.8	324	—	—	—	—	—	61.8
Coimbra		89.0	313	e 13 33	+23	e 26 34	?	37.8	55.6
Stonyhurst		90.1	325	—	—	—	—	—	69.3
Bidston		90.3	325	—	—	—	—	—	71.8
Eskdalemuir		91.0	328	—	—	e 23 48	-36	37.3	57.8
Dyce	N.	91.3	30	—	—	—	—	37.3	72.8
Edinburgh		91.3	328	44 48	?L	—	—	(44.8)	—
La Paz		127.7	236	12 24	?	—	—	51.2	55.2
Ithaca		138.2	320	—	—	—	—	—	77.8
Toronto		139.2	324	—	—	—	—	e 78.4	87.5
Georgetown	E.	140.4	316	—	—	—	—	75.8	—
Washington		140.4	316	—	—	—	—	e 69.8	—
Ann Arbor	N.	142.5	325	61 48	?L	—	—	(61.8)	—
Victoria		143.7	12	—	—	—	—	—	89.8
Chicago		144.9	327	e 19 35	[-13]	30 33	?	62.6	—

Additional readings : Belgrade gives also $SR_1E = +22m.4s.$, $SR_1N = +21m.47s.$
 Rocca di Papa $ePN = +11m.47s.$, $iP = +11m.49s.$ Riverview $MN = +44.3m.$
 Granada $MN = +51.3m.$ Uccle $SR_1 = +23m.52s.$ San
 Fernando $MN = +53.3m.$ Coimbra $MN = +52.9m.$ Eskdalemuir
 $MN = +71.8m.$ Dyce $L = +55.3m.$ Toronto $eL = +80.0m.$

Feb. 14d. Readings also at 0h. (De Bilt, Stonyhurst, and near Tokyo), 3h. (River-view), 11h. (St. Louis and near Tokyo), 14h. (Rio Tinto and Kew), 16h. (near La Paz), 18h. (Batavia).

Feb. 15d. 1h. 16m. 6s. Epicentre $37^{\circ}0'N$. $141^{\circ}0'E$.

$$A = -.621, B = +.502, C = +.602.$$

Very rough.

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo		1.7	i 0 33	+ 7	i 0 47	- 1	i 0.9	1.6
Mizusawa	N.	2.1	0 35	+ 2	1 1	+ 3	—	—
Nagoya		3.8	0 49	-10	—	—	1.8	2.2
Osaka		5.1	—	—	2 4	-16	3.0	3.8
Kobe		5.3	1 53	+31	—	—	i 3.0	4.1

Additional readings: Tokyo gives also MN = +1.0m. Mizusawa SE = +0m.57s. Osaka MN = +3.9m. Kobe MN = +4.6m.

Feb. 15d. 8h. 10m. 0s. Epicentre $48^{\circ}0'S$. $170^{\circ}0'E$.

$$A = -.659, B = +.116, C = -.743; \quad D = +.174, E = +.985; \\ G = +.732, H = -.129, K = -.669.$$

Very scanty material, and the determination is not at all reliable.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview		20.0	308	(e 4 36)	- 5	e 4 36	?P	e 10.1	11.5
Melbourne		20.9	290	—	—	e 8 24	-18	10.8	11.4
Adelaide		26.6	288	—	—	e 11 0	+27	e 12.0	12.6
Manila		76.3	311	e 12 0	+ 3	—	—	—	—
La Paz		97.3	125	—	—	e 34 41	?SR ₁	44.2	47.0
Zagreb		162.2	273	—	—	—	—	92.0	95.0
Rocca di Papa	E.	162.8	257	e 19 18	[-52]	—	—	e 93.6	—
Algiers		165.3	225	—	—	—	—	e 68.0	88.0
Hamburg		166.2	302	—	—	—	—	e 94.0	—
San Fernando		168.1	195	32 54	?	—	—	—	94.5
Granada		168.2	206	e 20 13	[-1]	36 56	?	e 56.0	89.3
Strasbourg		168.2	279	—	—	—	—	e 50.0	—
De Bilt		169.5	299	—	—	e 53 0	?	e 84.0	95.0
Rio Tinto		169.5	195	14 0	?	—	—	—	18.0
Tortosa	N.	169.6	230	—	—	—	—	e 74.0	86.2
Dyce	N.	169.7	336	—	—	—	—	90.5	95.0
Uccle	N.	170.3	292	—	—	—	—	—	81.0
Edinburgh		171.1	335	93 0	?L	—	—	(93.0)	—
Eskdalemuir		171.6	332	—	—	—	—	80.0	—
Paris		171.7	280	—	—	—	—	e 92.0	93.0
Stonyhurst		172.4	324	e 67 30	?L	—	—	(e 67.5)	96.0
Kew		172.8	304	—	—	—	—	—	103.0
Bidston		173.0	324	—	—	—	—	—	103.7

Additional readings: Riverview gives also MN = +14.0m. Melbourne
SR₁ = +9m.24s. Helwan ($\Delta = 143^{\circ}7'$) gives a reading at 8h. Rocca
di Papa iPN = +19m.36s. San Fernando MN = +89.0m. Granada
i = +21m.53s. De Bilt MN = +93.7m.

Feb. 15d. Readings also at 0h. (Taihoku), 4h. (Manila, Zi-ka-wei, and Taihoku), 11h. (Perth), 12h. (Azores and Strasbourg), 14h. (Manila, Riverview, Melbourne, Adelaide, and Sydney), 15h. (Eskdalemuir, Uccle, De Bilt, and Stonyhurst), 22h. (Manila and La Paz), 23h. (La Paz).

Feb. 16d. 2h. 51m. 0s. Epicentre $46^{\circ}5'N$, $28^{\circ}3'W$. (as on 1921 Oct. 21d.).

A = +.606, B = -.326, C = +.725; D = -.474, E = -.880;
G = +.639, H = -.344, K = -.688.

		Δ °	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Coimbra		15.7	106	4 4	-16	5 45	-63	7.3	—
Bidston		17.5	58	5 0	+49	7 46	+17	—	13.3
Eskdalemuir		17.9	52	4 13	-3	e 7 23	-15	8.0	—
Stonyhurst		18.0	56	e 4 30	+13	—	—	—	10.3
Edinburgh		18.2	50	—	—	—	—	—	9.3
Oxford		18.3	63	i 4 20	-1	(7 42)	-5	8.2	9.4
Kew		18.9	64	—	—	—	—	—	10.0
Dyce	N.	19.2	46	—	—	—	—	i 9.0	—
Granada		20.5	108	i 4 52	+5	—	—	10.2	—
Paris		20.7	72	4 53	+4	—	—	11.0	11.0
Tortosa	N.	21.5	95	5 4	+5	9 0	-5	11.6	12.3
Uccle		21.8	67	5 0	-3	9 1	0	e 10.0	—
De Bilt		22.3	63	e 5 11	+2	e 9 6	-5	e 10.6	12.9
Barcelona		22.3	92	e 5 10	+1	9 20	+9	—	—
Besançon		23.3	76	5 20?	0	—	—	—	—
Strasbourg		24.2	72	i 5 27	-3	9 48	0	12.0	14.8
Moncalieri		24.9	80	4 21	-76	10 6	+5	14.0	—
Algiers		25.2	101	5 43	+3	e 10 15	+8	13.0	14.5
Hamburg		25.2	60	—	—	e 11 0	+53	—	15.0
Zagreb		30.2	75	—	—	—	—	e 13.0	—
Manila		113.0	32	—	—	—	—	e 47.0	—

Additional readings: Bidston gives alternative P = +5m.56s. Granada
is = +12m.38s. De Bilt MN = +11.8m.

Feb. 16d. 3h. 14m. 48s. Epicentre $13^{\circ}0'N$, $85^{\circ}4'W$. (as on 1919 Dec. 5d.).

A = +.078, B = -.971, C = +.225; D = -.997, E = -.080;
G = +.018, H = -.224, K = -.974.

		Δ °	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Balboa Hts.	E.	7.0	124	1 36	-10	2 48	-22	3.5	4.9
	N.	7.0	124	1 40	-6	2 52	-18	3.6	5.8
Oaxaca		11.7	292	2 17	-38	5 37	+25	6.2	6.9
Port au Prince		13.8	65	—	—	—	—	7.9	10.3
Tacubaya	E.	14.7	298	3 26	-9	7 45	?L	—	—
	N.	14.7	298	3 24	-11	7 42	?L	8.4	8.6
Porto Rico	E.	19.9	72	4 42	+2	8 24	+3	10.1	26.0
	N.	19.9	72	4 59	+19	—	—	12.7	15.1
Mazatlan		22.4	300	3 23	-107	—	—	11.0	13.9
St. Louis		26.0	351	5 48	0	10 30	+8	e 18.4	21.0
Cheltenham	E.	26.8	15	—	—	12 35	+118	15.5	16.3
	N.	26.8	15	7 4	+68	—	—	26.8	40.3
Georgetown	E.	26.9	14	c 5 55	-2	e 10 44	+5	e 13.0	17.7
	N.	26.9	14	c 5 55	-2	e 10 50	+11	—	17.4
Washington		26.9	14	7 4	+67	11 4	+25	12.7	—
Chicago		28.8	355	5 51	-25	i 10 59	-14	14.1	18.7
Ann Arbor	E.	29.3	3	12 18	?S	(12 18)	+56	21.8	—
	N.	29.3	3	8 36	?PR ₁	15 36	?L	21.8	—
Fordham		29.6	18	5 26	-58	11 28	+1	—	9.2
Tucson	E.	30.2	314	7 19	+49	—	—	17.9	19.5
Ithaca		30.4	13	—	—	11 34	-7	16.3	—
Toronto		31.1	9	—	—	13 12	?SR ₁	e 17.9	25.6
Northfield		33.1	18	—	—	—	—	e 14.2	—
Ottawa		33.4	13	i 6 49	-11	i 12 20	-10	18.2	—
La Paz		34.1	150	6 43	-23	11 55	-47	i 14.4	22.0
Berkeley		41.1	315	e 9 45	?PR ₁	—	—	e 22.0	23.7
Victoria		47.3	326	—	—	e 21 43	?	27.7	—
Coimbra	E.	71.8	51	e 10 2	-86	19 1	-107	31.0	43.0
	N.	71.8	51	e 9 57	-91	e 20 52	+4	—	—
Rio Tinto		73.3	54	36 12	?L	—	—	(36.2)	49.2
San Fernando	E.	73.7	56	—	—	—	—	—	36.9
Edinburgh		74.9	37	38 42	?L	—	—	(38.7)	46.0
Eskdalemuir		74.9	37	—	—	e 21 20	-5	32.2	43.2
Bidston		75.0	40	19 48?	?S	(19 48?)	-98	(27.6?)	34.6

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Stonyhurst		75.4	40	e 22 12	?S	(e 22 12)	+42	—	45.2
Dyce	N.	75.5	34	—	—	—	—	32.8	39.2
Granada		75.7	55	i 11 43	-10	i 21 36	+ 2	33.1	35.4
Oxford		76.2	40	—	—	—	—	35.1	47.7
Kew		76.8	40	35 12	?L	—	—	(35.2)	52.2
Tortosa	N.	78.5	51	12 8	- 2	22 8	+ 2	33.4	42.1
Paris		78.9	43	—	—	—	—	e 35.2	42.2
Barcelona		79.6	50	e 12 52	+35	e 21 32	-47	e 35.0	45.2
Uccle		79.8	41	—	—	(22 17)	- 4	33.7	44.2
De Bilt	E.	80.1	40	—	—	22 21	- 3	e 37.2	48.4
	N.	80.1	40	—	—	—	—	e 33.2	36.1
Algiers		81.0	54	—	—	—	—	e 35.2	47.2
Besançon		81.5	45	—	—	—	—	42.2	—
Strasbourg		82.4	43	—	—	—	—	41.9	45.7
Hamburg		82.7	37	—	—	—	—	e 37.2	49.2
Moncalieri		83.0	46	12 18	-18	22 50	- 7	33.6	45.2
Pola		87.2	45	—	—	e 23 31	-12	—	55.1
Rocca di Papa		87.3	48	e 12 47	-14	e 21 6	?	e 44.0	—
Vienna		88.0	40	12 54	-11	23 54	+ 2	e 43.7	47.2
Königsberg	N.	88.2	34	—	—	—	—	e 49.3	50.2
Zagreb		88.4	43	—	—	e 23 50	- 6	38.2	49.2
Helwan		105.6	53	—	—	e 22 12	?	53.2	59.7
Capetown		108.7	123	—	—	—	—	—	63.2
Manila		142.0	315	—	—	—	—	e 92.2	—
Kodaikanal		151.2	37	98 48	?L	—	—	(98.8)	—
Colombo		155.3	37	75 12	?L	—	—	(75.2)	102.2

Additional readings: Oaxaca gives also MN = +7.1m. St. Louis SE = +10m.36s. Cheltenham eE = +10m.17s., eN = +8m.51s., eE = +14m.15s. Washington L = +15.7m. Ann Arbor SE = +18m.36s. Ithaca e = 13m.37s. Toronto E? = +9m.24s., eL = +23.4m. Ottawa LEN = +23.2m., T₀ = 3h.14m.40s. Berkeley eE = +9m.46s., MN = +25.7m. San Fernando MN = +41.7m. Uccle S is given as PR., also S = +27m.33s. (?SR₁). Moncalieri MN = +46.5m. Pola e = 3h.5m.?, MN = +55.4m. Rocca di Papa iPN = +12m.48s., eL = +46.7m. Zagreb MNW = +50.2m.

Feb. 16d. Readings also at 1h. and 2h. (Innsbruck), 6h. (Hong Kong), 7h. (Vera Cruz), 10h. (Zagreb and near Port au Prince), 11h. (Algiers), 15h. (La Paz), 19h. (near Taihoku).

Feb. 17d. Readings at 2h., 5h., and 6h. (La Paz), 7h. (near Kobe), 11h. (Helwan), 16h. (Taihoku), 17h. (La Paz), 21h. (Taihoku).

Feb. 18d. Readings at 0h. (Manila), 2h. (Taihoku), 4h. (Riverview), 6h. (Helwan), 7h. (Rocca di Papa), 13h. and 16h. (La Paz), 21h. (Azores), 22h. (Riverview, Adelaide, and Sydney).

Feb. 19d. 21h. 52m. 34s. Epicentre 32° 5N. 31° 5W. (as on 1913 Dec. 25d.).

A = +.719, B = -.441, C = +.537; D = -.523, E = -.853;
G = -.458, H = -.281, K = -.843.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Coimbra		20.1	61	4 51	+ 9	7 51	-34	8.9	10.7
Rio Tinto		21.0	69	9 26	?L	—	—	(9.4)	12.9
Granada		23.3	70	e 5 33	-13	i 9 0	-31	11.1	13.9
Tortosa	N.	26.9	63	—	—	—	—	e 12.4	13.4
Bidston		29.2	36	10 26	?S	(10 26)	-54	(12.7)	16.9
Oxford		29.2	40	—	—	—	—	—	14.8
Kew		29.6	41	—	—	—	—	—	16.4
Stonyhurst		29.7	36	e 9 26	?	—	—	—	15.4
Paris		30.2	46	—	—	e 10 26	-71	—	14.4
Dyce	N.	31.8	29	—	—	—	—	12.4	14.4

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Uccle	32.0	44	—	—	e 11 53	-15	e 14.4	15.4
De Bilt	32.9	42	—	—	12 13	-9	e 14.4	16.4
Strasbourg	33.4	49	—	—	—	—	e 15.4	—
Rocca di Papa	36.0	61	—	—	—	—	16.6	36.6
Ottawa	36.2	304	—	—	e 11 45	-88	e 14.9	—
Hamburg	36.2	42	e 6 26	-58	—	—	e 16.8	18.4
Ithaca	36.6	299	—	—	(e 13 26)	s	15.3	—
Georgetown E.	37.1	292	—	—	—	—	16.7	—
Washington	37.1	292	—	—	(e 13 44)	+19	e 13.7	—
Zagreb	38.3	56	—	—	e 12 26	-76	—	21.4
Toronto	38.7	301	—	—	—	—	22.3	24.5
Ann Arbor N.	41.9	300	—	—	(14 14)	-20	14.2	—
Königsberg N.	42.4	42	—	—	—	—	e 23.1	24.5
Chicago	41.9	299	9 51	79	13 58	-76	15.8	—
La Paz	60.2	220	10 13	0	18 25	-1	29.0	42.7

Additional readings and notes: Coimbra gives also MN = -10.2m., T_n = 21h.53m.42s. Granada i = +6m.6s., S? = 10m.13s. Bidston P = +12m.6s. Paris MN = +12.4m. De Bilt MN = +16.3m. Ottawa LE = +19.4m. Ithaca S is given as eL. Georgetown eLN? = +13.8m., LN = +15.0m. Helwan (Δ = 53.0) gives a reading at 22h. simply.

Feb. 19d. Readings also at 6h. (Zante and near Athens), 1h. and 4h. (Riverview), 7h. (Osaka and Manila), 18h. (Batavia), 19h. (La Paz), 20h. (Zi-ka-wei), 21h. (La Paz, Manila, and Riverview), 23h. (La Paz).

Feb. 20d. 7h. 43m. 50s. Epicentre $17^{\circ}08'S$, $168^{\circ}0'W$. (as on 1914 Dec. 20d.).

A = -0.935, B = -0.199, C = -0.292; D = -0.208, E = +0.978;
G = -0.286, H = -0.061, K = -0.956.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	4.8	310	1 18	+ 4	2 16	+ 5	—	3.2
Wellington	28.5	208	e -0 22	?	e 9 34	-94	e 13.8	14.7
Christchurch	30.9	208	(6 34)	- 3	6 34	?P	16.9	20.5
Riverview	40.2	237	—	—	e 15 10	+60	e 16.7	19.5
Sydney E.	40.2	237	7 58	+ 1	—	—	17.5	20.4
Melbourne	46.1	233	—	—	13 22	-127	20.8	24.7
Adelaide	50.7	238	—	—	e 14 10	-137	e 27.0	27.7
Perth	69.6	241	9 15	-120	19 1	-80	35.3	—
Manila	76.9	290	e 11 52	- 8	—	—	—	—
Batavia	83.6	266	i 11 56	-44	i 22 30	-35	—	—
La Paz	94.2	109	e 18 15	?PR ₁	24 13	-45	—	48.0
Chicago	94.3	48	—	—	—	—	e 50.2	—
Ann Arbor N.	97.3	48	—	—	—	—	51.3	—
Toronto	100.6	47	—	—	—	—	e 56.8	60.8
Georgetown E.	101.3	53	—	—	—	—	e 56.8	—
Ottawa	103.5	46	—	—	e 47 58	?	e 53.7	—
Stonyhurst	141.5	14	73 10	?L	—	—	(73.2)	90.2
Zagreb N.W.	151.0	354	e 19 58	(- 1)	—	—	—	—

Additional readings: Christchurch gives also SR₁ = +11m.16s., SR₂ = -12m.52s. Riverview e = +12m.4s., MN = +19.2m. Melbourne SR₁ = +16m.40s. Adelaide e = +20m.10s., eL? = +22.2m.; the reading taken as L is given as e. Perth +5m.9s., PR₁ = +12m.32s. Batavia i = +21m.47s.

Feb. 20d. Readings also at 11h. and 12h. (near Mizusawa), 13h. (Apia and Wellington), 15h. (Wellington and Adelaide), 16h. (Christchurch and Riverview), 17h. (Tiflis).

Feb. 21d. Readings at 3h. (Taihoku), 18h. (Honolulu).

Feb. 22d. 17h. 18m. 40s. Epicentre $28^{\circ}0'N$. $127^{\circ}0'E$.

$$A = -.531, B = +.705, C = +.470.$$

Very rough.

	Δ	P.	O-C.	S.	O-C.	L.	M.
		m. s.	s.	m. s.	s.	m.	m.
Nagasaki	5.3	1 33	+11	—	—	2.6	—
Taihoku	5.7	e 1 36	+ 8	—	—	2.6	—
Zi-ka-wei	5.8	i 1 40	+10	e 2 35	- 4	—	3.1
Tokyo	13.2	e 2 56	-20	—	—	e 5.0	6.6
Manila	14.6	e 5 55	?S	(e 6 5)	-17	—	—

Zi-ka-wei gives also $MN = +3.0m$.

Feb. 22d. Readings also at 8h. (Edinburgh), 9h. (near Mizusawa), 19h. (La Paz), 22h. (Zagreb, Vienna, and La Paz), 23h. (Simla).

Feb. 23d. Readings also at 0h. (Perth), 2h. (Algiers), 14h. (La Paz), 15h. (Manila), 16h. (Riverview, Adelaide, Sydney, Perth, and Melbourne), 17h. (La Paz), 20h. (near Padova, Pola, Rocca di Papa, Vienna, and Zagreb), 23h. (Manila and Zagreb).

Feb. 24d. 13h. 27m. 20s. Epicentre $40^{\circ}5'N$. $22^{\circ}5'E$.

$$A = +.702, B = +.291, C = +.649; \quad D = +.383, E = -.924; \\ G = +.600, H = +.248, K = -.760.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Athens	2.8	160	0 35	- 9	1 30	+13	e 1.7	2.2
Belgrade	4.6	342	i 1 19	+ 8	i 1 56	-10	—	2.0
Zagreb N.W.	7.1	320	—	—	e 2 58	-15	i 4.1	9.4
Rocca di Papa	7.5	282	e 4 22	?L	—	—	(e 4.4)	—
Pola	7.7	307	—	—	—	—	e 3.8	—

Additional readings: Athens gives also $MN = +2.5m$. Zagreb $MNE = +9.2m$. Rocca di Papa $e = +34s$. Helwan gives small tremor at 13h.

Feb. 24d. Readings also at 0h. (near Tokyo and Mizusawa), 5h. (La Paz, De Bilt Chicago, Honolulu, and Victoria), 6h. (Zi-ka-wei), 8h. (Zi-ka-wei and near Mizusawa), 20h. (La Paz).

Feb. 25d. Readings at 3h. (near La Paz), 10h. (Zagreb), 13h. (Manila), 23h. (Dyce).

Feb. 26d. 8h. 56m. 40s. Epicentre $44^{\circ}0'N$. $145^{\circ}0'E$.

$$A = -.589, B = +.413, C = +.695; \quad D = +.574, E = +.819; \\ G = -.569, H = +.399, K = -.719.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	3.1	329	1 2	+13	—	—	2.1	2.8
Mizusawa	5.7	212	1 30	+ 2	2 40	+ 4	—	—
Manila	35.8	223	e 6.48	-32	—	—	—	—
Victoria	59.7	259	—	—	—	—	27.8?	32.4
Colombo	67.4	259	44 20	?L	—	—	(44.3)	49.3
De Bilt E.	77.8	336	—	—	—	—	e 38.3	—
Uccle	79.2	336	e 12 2	-12	—	—	e 38.3	—
Zagreb	79.5	327	e 12 14	- 2	—	—	—	—

Additional readings: Ootomari gives also $MN = +2.7m$. Mizusawa $SN = +2m.12s$. De Bilt $cLN = +40.3m$.

Feb. 26d. Readings also at 2h. (La Paz), 3h. (Colombo), 5h. (Tortosa and Alicante), 7h. (Colombo), 18h. (near Chur, Innsbruck, Zurich, Munich, Padova, and Zagreb), 19h. (Almeria and Bidston), 20h. and 22h. (La Paz).

Feb. 27d. 20h. 39m. 50s. Epicentre $10^{\circ}0'N$. $123^{\circ}0'E$.

A = -·536, B = +·826, C = +·174 ; D = +·839, E = +·545 ;
G = -·095, H = +·146, K = -·985.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	5·0	337	e 1 19	+ 2	(2 21)	+ 4	2·4	4·6
Hong Kong	14·9	327	3 35	- 3	—	—	9·3	—
Zi-ka-wei	21·2	356	4 56	+ 1	e 8 48	0	—	—
Batavia	22·8	225	i 5 15	0	—	—	i 10·8	—
Colombo	42·7	269	10 22	+126	—	—	—	31·2
Riverview	51·4	150	—	—	e 16 28	- 8	—	20·7
De Bilt	98·4	327	—	—	—	—	e 51·2	53·4
Uccle	99·4	326	—	—	—	—	e 51·2	—
Eskdalemuir	100·9	332	—	—	—	—	49·2	—

Additional readings: Manila gives also MN = +4·3m. Riverview MN = +20·5m. De Bilt MN = +53·6m.

Feb. 27d. Readings also at 2h. (Kobe (2)), 6h. (Zante), 15h. (La Paz), 17h. (Tortosa and La Paz).

Feb. 28d. Readings at 1h. (near Manila and near Tokyo and Mizusawa), 13h. (Perth and near Tokyo and Mizusawa), 14h. (Perth), 15h. (near Melbourne and Riverview), 17h. (Tiflis), 21h. (Tucson, La Paz, Georgetown, Washington, Ann Arbor, Chicago, Ottawa, Toronto, Vera Cruz, Oaxaca, and Tacubaya).

Mar. 1d. Readings at 7h. (Taihoku), 8h. (La Paz), 9h. (Zi-ka-wei, Manila (2), and Helwan), 11h. (Helwan), 16h. (Besançon and La Paz), 17h. (La Paz (2)), 21h. (Berkeley and Tiflis).

Mar. 2d. 14h. 49m. 27s. Epicentre $43^{\circ}0'N$. $44^{\circ}0'E$. (as on 1921 June 29d.).

A = +·526, B = +·508, C = +·682 ; D = +·695, E = -·719 ;
G = +·491, H = +·474, K = -·731.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Lemberg	15·3	303	—	—	e 6 3	-36	e 10·2	11·6
Belgrade	17·0	284	e 5 56	?	e 9 2	?L	e 13·5	—
Budapest	18·0	293	3 52	+25	—	—	—	—
Konigsberg	19·3	316	i 4 34	+ 1	8 2	- 6	12·2	—
Vienna	19·9	295	i 4 45	+ 5	e 8 30	+ 9	10·9	12·8
Zagreb	20·1	288	e 4 48	+ 6	—	—	e 12·6	—
Pola	21·6	285	—	—	e 8 45	-12	—	15·5
Rocca di Papa	23·0	278	i 5 18	+ 1	—	—	—	6·0
Upsala	23·2	326	i 5 26	+ 7	i 9 27	- 2	—	15·3
Hamburg	24·7	307	e 5 49	+14	e 9 52	- 5	e 12·8	17·8
De Bilt	27·4	303	—	—	e 10 47	- 1	e 13·8	—
Eskdalemuir	32·5	309	—	—	—	—	14·6	—

Additional readings: Belgrade gives also L = +22·9m., e = +40m.57s. Konigsberg iPE = +4m.38s., SN? = +8m.0s., LN = +10·2m., and LE = +13·3m. Vienna iPEZ = +4m.46s., iZ = +4m.52s., +5m.3s., and +5m.14s. Rocca di Papa iPN = +5m.21s. Upsala iSN = +9m.25s., all readings given as for 13h. Hamburg MN = +18·8m. Helwan gives slight tremors at 14h.

Mar. 2d. Readings also at 0h. (Marseilles), 3h. (near Algiers), 9h. (Stonyhurst, Nagasaki, and La Paz), 10h. (De Bilt, Stonyhurst, and Eskdalemuir), 13h. (Tiflis), 14h. (Taihoku and Batavia), 15h. (Taihoku).

Mar. 3d. Readings at 2h. (La Paz (2)), 21h. (near Tokyo), 23h. (La Paz).

1922. Mar. 4d. 13h. 7m. 34s. Epicentre 52°5N. 157°5E.

A = -·562, B = +·233, C = +·793 ; D = +·383, E = +·924 ;

G = -·733, H = +·304, K = -·609.

A depth of focus 0·030 is assumed ; see note at end.

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari		-0·5	11·2	244	2 47	+ 7	(4 47)	- 1	4·8	4·9
Mizusawa	E.	-1·0	17·5	227	4 1	+ 2	7 12	+ 5	—	—
	N.	-1·0	17·5	227	4 2	+ 3	7 10	+ 3	—	—
Tokyo		-1·3	21·0	224	5 0	+23	6 11	?	7·7	8·7
Nagoya		-1·4	22·6	228	4 42	-13	—	—	—	10·5
Osaka		-1·5	23·7	230	5 4	- 3	(9 0)	- 9	9·0	9·2
Kobe		-1·5	23·9	230	5 7	?	(19 3)	-10	9·0	10·4
Nagasaki	E.	-1·8	28·0	236	5 33	-17	(10 15)	-11	10·2	16·1
	N.	-1·8	28·0	236	—	—	(10 2)	-24	10·0	12·0
Zi-ka-wei		-2·2	33·7	245	5 46?	-57	e 10 56	-64	—	15·8
Taihoku	E.	-2·4	38·5	239	7 11	-12	10 25	?	12·6	—
Hong Kong		-2·8	44·6	244	7 56	-13	—	—	20·4	22·9
Honolulu	E.	-2·9	46·1	116	8 20	0	14 47	- 4	21·4	—
	N.	-2·9	46·1	116	—	—	14 59	+ 8	21·5	—
Manila		-3·0	47·7	232	8 28	- 3	(15 1)	-10	15·0	17·8
Victoria		-3·0	48·0	61	9 35	+62	i 16 2	+47	21·1	22·5
Berkeley		-3·4	55·3	71	9 20	+ 1	i 17 10	+27	e 23·7	—
Calcutta		-3·6	59·7	270	9 44	- 3	14 25	? PR ₁	19·2	—
Upsala		-3·7	63·1	339	10 9	+ 1	i 18 20	+ 4	—	37·2
Konigsberg	N.	-3·7	66·9	335	10 33	0	19 3	0	35·5	44·2
	E.	-3·7	66·9	335	10 36	+ 3	19 6	+ 3	35·4	36·7
Dyce	N.	-3·8	69·0	350	10 49	+ 3	20 29	+62	—	—
Tiflis		-3·8	69·3	314	(9 56)	-52	9 56	? P	27·4	—
Chicago		-3·8	70·2	46	11 48	+54	19 46	+ 4	29·6	—
Lemberg		-3·8	70·3	330	e 11 2	+ 7	—	—	e 28·6	36·2
Edinburgh		-3·8	70·4	350	—	—	i 19 47	+ 2	—	—
Hamburg		-3·8	70·5	341	i 10 59	+ 3	i 19 54	+ 8	—	41·8
Eskdalemuir		-3·8	71·0	350	i 10 57	- 2	i 19 55	+ 3	—	—
Ann Arbor	E.	-3·8	71·5	43	14 2	? PR ₁	22 8	?	40·0	—
	N.	-3·8	71·5	43	14 8	? PR ₁	22 38	?	33·3	—
St. Louis		-3·8	71·8	50	i 11 1	- 2	i 20 6	+ 6	e 30·4	—
Bombay		-3·8	71·9	278	11 11	+ 6	—	—	—	—
Ottawa		-3·8	72·0	37	i 12 0	+55	i 20 7	+ 3	e 29·4	—
Toronto		-3·8	72·1	40	10 8	-58	17 2	?	e 33·5	45·1
Stonyhurst		-3·8	72·3	348	—	—	(20 26)	+18	20·4	22·2
Batavia		-3·9	72·6	233	i 11 13	+ 4	i 20 16	+ 6	—	—
De Bilt		-3·9	72·8	343	11 14	+ 4	i 20 20	+ 7	—	42·6
Bidston		-3·9	72·9	348	18 2	? PR ₁	21 14	+60	—	22·4
West Bromwich		-3·9	73·6	347	11 16	+ 1	20 22	0	—	—
Vienna		-3·9	73·9	334	i 11 18	+ 1	i 20 29	+ 3	28·7	38·4
Budapest		-3·9	73·9	332	i 10 50	-27	e 20 2	-24	30·0	—
Oxford		-3·9	74·2	348	—	—	i 20 22	+ 2	—	—
Northfield		-3·9	74·2	35	12 15	+56	20 32	+ 2	—	—
Uccle		-3·9	74·2	344	11 19	0	30 33	+ 3	—	—
Kew		-3·9	74·3	348	—	—	—	—	—	28·4
Strasbourg		-3·9	75·7	340	i 11 28	0	20 50	+ 2	33·4	42·7
Belgrade		-3·9	75·9	330	i 11 31	+ 1	i 20 50	0	e 29·7	36·7
Innsbruck		-3·9	76·1	337	i 11 31	0	i 20 55	+ 3	e 35·3	42·8
Zagreb	N.E.	-3·9	76·3	333	i 11 32	0	i 20 57	+ 2	—	42·6
	N.W.	-3·9	76·3	333	e 11 33	+ 1	i 20 54	- 1	e 33·5	40·4
Paris		-3·9	76·5	344	i 11 34	0	i 20 59	+ 2	36·4	45·4
Fordham	E.	-3·9	76·6	38	e 12 27	+53	e 21 1	+ 3	e 31·2	—
Zurich		-3·9	76·6	339	e 11 33	- 1	i 21 0	+ 2	—	—
Colombo		-3·9	76·9	266	11 26	-10	—	—	—	27·9
Georgetown	E.	-3·9	77·0	40	e 11 26	-11	i 21 6	+ 3	e 32·8	—
	N.	-3·9	77·0	40	11 38	+ 1	21 9	+ 6	47·0	—
Washington		-3·9	77·0	40	13 26	+109	22 5	+62	—	—
Besançon		-3·9	77·4	340	11 40	+ 1	21 8	0	33·4	—
Padova		4·0	77·7	336	9 59	?	19 26	-104	—	19·8
Pola		-4·0	77·7	334	e 11 42	- 2	e 21 12	+ 2	e 35·0	41·4
Moncalieri		-4·0	79·1	339	11 43	- 7	22 6	+39	30·8	45·9
Florence		-4·0	79·4	337	11 51	0	21 26	- 4	—	32·9
Rocca di Papa		-4·0	80·9	334	11 54	- 6	i 21 41	- 7	e 33·6	—
		-4·0	80·9	334	i 11 56	- 4	e 21 44	- 4	i 23·9	—

Continued on next page.

	Corr. for Focus	Δ	Az.	P.	O—C.	S.	O—C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	—	81.1	325	11 58	— 4	i 21 44	— 6	e 38.4	—
Pompeii	—	81.4	332	12 1	— 2	21 46	— 7	39.4	42.4
Tacubaya	E.	82.4	69	12 6	— 3	22 6	+ 1	—	—
	N.	82.4	69	12 9	0	22 8	+ 3	—	—
Barcelona	—	83.6	342	e 12 13	— 3	22 15	— 3	e 35.2	46.3
Tortosa	—	84.5	344	12 16	5	22 17	— 11	e 38.4	—
Helwan	—	85.2	316	i 12 20	— 6	22 20	— 16	—	22.4
Coimbra	—	86.5	350	12 24	— 8	i 22 43	— 7	37.4	—
Riverview	—	86.5	185	e 12 27	— 5	e 22 27	— 23	e 38.9	43.7
Algiers	—	88.0	339	12 29	— 12	22 36	— 31	50.9	—
Rio Tinto	—	88.6	349	25 26	? SR ₁	—	—	—	27.4
Granada	—	88.8	347	i 12 38	8	i 23 12	— 3	e 38.7	51.2
San Fernando	—	89.8	348	—	—	—	—	—	25.0
Melbourne	—	91.0	190	—	—	—	—	43.9	46.3
Perth	—	91.9	215	17 29	? PR ₁	23 0	— 49	29.0	—
La Paz	—	129.3	60	19 1	[— 16]	31 51	+ 115	58.2	—
Cape Town	—	145.5	284	19 18	[— 31]	—	—	—	—

Additional readings: Ootomari MN = +4.8m. Osaka MN = +9.1m.
 Kobe MN = +9.3m. Nagasaki SN = +6m.28s., SE = +6m.32s. Hono-
 lulu PR₁N = -9m.55s., SR₁E = -17m.56s., SR₁N = -17m.46s., SR₂E =
 -19m.16s., SR₂N = +19m.7s. Manila MN = -15.2m. Victoria
 L = +26.9m. Berkeley iNEZ = +10m.10s., iNE = +18m.50s. Upsala
 i = +11m.35s., PR₁ = +13m.17s., i = +19m.36s., and +19m.57s., MN =
 +40.7m. Königsberg E = +11m.27s., PR₁Z = -13m.44s., PR₂Z =
 +15m.31s., PSN = +20m.4s., PSE = +20m.7s. Dyce iN = +19m.34s.
 Tiflis P? = 13h.7m. Chicago PR₁ = +14m.28s. Hamburg MN =
 +40.4m. Ottawa iPR₁N = +14m.33s., T₀ = 13h.9m.30s. Toronto
 E = +13m.50s., iL = +26.8m., eL = +44.4m. Stonyhurst P = 12h.45m.0s.
 De Bilt i = +20m.57s. Vienna iZ = +11m.32s., iS? = +19m.57s. Uccle
 i = +12m.13s., and +22m.9s., SR₁ = +26m.45s. Epicentre 55°N. 152°E.
 Strasbourg iV = +12m.22s., iN = +16m.56s., iE = +22m.28s., MN = +43.2m.
 Belgrade PR₁E = +12m.24s., PR₁N = +12m.28s., PR₂EN = +16m.59s.,
 SR₁E = +22m.0s., SR₁N = +22m.4s., MN = +36.6m. Zagreb iPNW =
 +11m.40s., i = +11m.52s., iPR₁ = +14m.28s. Paris i = +22m.35s.,
 MN = +44.4m. Fordham SN = +21m.3s. Zurich i = +12m.51s., and
 +22m.41s. Epicentre 53°0N. 145°0E. Georgetown iE = +12m.31s.,
 iN = +12m.34s. Pola MN = +42.5m. Moncalieri MN = +39.2m.
 Rocca di Papa iSN = +21m.51s. Athens iP = +11m.59s., i = +16m.0s.,
 T₀ = 13h.7m.46s. Barcelona S = +23m.55s. Coimbra iE = +24m.18s.,
 LE = +51.4m., T₀ = 13h.7m.37s. Epicentre 57°6N. 171°0E. River-
 view iPS? = +22m.47s., MN = +45.3m. Granada PR₁ = +16m.14s.,
 iS = +22m.42s., SR₁ = +25m.5s. San Fernando MN = +26.1m. La
 Paz iPR₁ = +19m.54s.

The evidence for the abnormal focal depth rests chiefly on the Japanese stations in azimuths near 225°, and the American stations in azimuths near 45°. But that of the latter is weakened by several cases of large positive P residuals (Victoria, Ottawa, Toronto, Northfield, Fordham, Washington), though Berkeley, St. Louis, and Georgetown are all in good accord.

Mar. 4d. Readings also at 2h. (Manila), 3h. (La Paz), 5h. (Manila, Nagoya, La Paz, Adelaide, Batavia, and Melbourne), 6h. (near Mizusawa), 13h. (Riverview, Adelaide, and Melbourne (2)), 17h. (Riverview), 20h. (Zagreb), 22h. (Batavia).

Mar. 5d. Readings at 2h. (La Paz), 4h. (near Mizusawa), 7h. (near Taihoku), 9h. (Batavia and near Tokyo), 10h. (Batavia, Zagreb, and near Belgrade), 19h. (La Paz), 23h. (Tokyo).

Mar. 6d. 21h. 20m. 30s. Epicentre $52^{\circ}5'N$, $157^{\circ}5'E$. (as on Mar. 4d.).

The same depth of focus 0.030 is assumed as on Mar. 4d.

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	-1.0	17.5	227	3 54	- 5	7 1	- 6	—	—
	N.	-1.0	17.5	227	4 0	+ 1	7 12	+ 5	—	—
Tokyo		-1.3	21.0	224	e 4 46	+ 9	—	—	—	—
Osaka		-1.5	23.7	230	26 36	?	—	—	—	31.9
Kobe		-1.5	23.9	230	i 5 10	0	—	—	—	10.9
Manila		-3.0	47.7	232	e 8 54	+23	(15 18)	+ 7	15.3	—
Batavia	E.	-3.9	72.6	233	i 10 32	-37	—	—	—	—

Additional readings: Kobe gives also MN = +10.0m.
+11m.30s. Helwan gives slight tremors at 21h.

Batavia iE =

Mar. 6d. Readings also at 12h. (near Taihoku).

Mar. 7d. 16h. 54m. 50s. Epicentre $23^{\circ}3'S$, $150^{\circ}6'E$. (as on 1918 June 6d.).

A = -0.800, B = +0.451, C = -0.396; D = +0.491, E = +0.871;
G = +0.344, H = -0.194, K = -0.918.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Sydney	E.	10.5	178	2 40	+ 3	—	—	6.9	8.9
Riverview		10.5	178	(e 2 41)	+ 4	e 2 41	?P	e 4.1	8.8
Melbourne		15.3	197	3 40	- 3	6 58	+19	8.5	11.6
Adelaide		15.6	219	(e 2 10)	-97	e 2 10	?P	e 7.2	10.1
Christchurch		27.2	144	5 52	- 8	10 16	-29	17.0	20.2
Perth		31.8	247	—	—	14 12	?L	19.1	—
De Bilt		141.0	326	—	—	—	—	e 55.2	—

Additional readings and notes: Riverview gives also P = 16h.53m.21s., MN = +17.0m. Adelaide e = +8m.52s. and +16m.28s., i = +13m.44s. Perth PR₁ = +9m.19s., SR₁ = +16m.1s., De Bilt eLN = +57.2m.

Mar. 7d. Readings also at 11h. (Hong Kong and Zi-ka-wei), 13h. (near Osaka, Kobe, and Nagoya), 14h. (Tiflis (2)), 16h. (Manila), 17h. (Hong Kong, Riverview, and Zi-ka-wei), 19h. (near Tokyo), 22h. (Batavia, Melbourne, Riverview, Sydney, and Manila), 23h. (De Bilt and Eskdalemuir).

Mar. 8d. 17h. 33m. 45s. Epicentre $34^{\circ}5'N$, $25^{\circ}0'E$. (as on 1921 Oct. 4d.).

A = +0.747, B = +0.348, C = +0.566; D = +0.423, E = -0.906;
G = +0.513, H = +0.239, K = -0.824.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens		3.6	344	1 9	+13	1 51	+12	2.0	2.5
Helwan		7.1	129	e 2 10	+22	3 35	?L	(3.6)	9.8
Pompeii		10.3	310	4 18	?S	(4 18)	-19	(6.3)	—
Belgrade		10.9	343	e 3 0	+17	i 4 57	+ 5	e 6.2	6.8
Rocca di Papa		12.1	310	i 3 9	1 9	i 6 9	?L	(i 6.2)	7.4
Zagreb	N.E.	13.2	331	e 3 22	1 6	i 5 43	- 6	e 7.1	8.1
	N.W.	13.2	331	e 3 26	1 0	i 5 46	- 3	e 7.2	9.0
Pola		13.4	321	3 15?	- 3	e 5 52	- 1	e 8.1	8.7
Budapest		13.7	313	e 5 51	?S	(e 5 51)	-30	—	—
Padova		14.8	321	3 33	- 3	8 7	?L	(8.1)	18.8
Vienna		15.2	337	3 44	2	i 7 20	+13	e 8.3	10.2
Lemberg		15.4	359	e 4 27	+43	—	—	e 8.4	10.0
Innsbruck	N.E.	16.4	326	e 3 58	+ 1	i 7 1	- 3	—	10.2
	N.W.	16.4	326	i 3 56	- 1	—	—	e 9.6	11.2

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Algiers	17.9	284	e 4 11	- 5	7 30	- 8	—	—
Strasbourg	19.0	323	e 4 21	- 8	e 7 57	- 5	—	11.2
Tortosa	N. 20.3	295	4 57	+12	8 15	-14	—	16.9
Königsberg	20.6	352	i 4 46	- 2	8 36	0	13.6	15.4
Hamburg	21.8	336	e 5 4	+ 1	e 9 15	-14	—	13.4
Uccle	22.1	324	e 5 3	- 3	e 9 24	+17	—	—
De Bilt	22.6	327	e 6 39	?PR ₁	e 8 57	-20	e 12.2	—
Granada	23.2	285	e 5 49	+30	—	—	—	—
Kew	24.9	321	—	—	—	—	—	19.2
Oxford	25.6	321	—	—	—	—	—	17.8
Upsala	25.8	352	5 59	+13	e 10 29	+11	e 15.0	19.0
Stonyhurst	27.3	324	e 7 15	+74	—	—	—	20.8
Eskdalemuir	28.5	326	—	—	e 11 15	- 7	14.2	—

Additional readings and notes: Athens gives also $iP = +1m.11s.$, $MN = +2.2m.$, $T_0 = 17h.34m.1s.$ Pompeii records S as P and L as S. Zagreb $iNE = +6m.20s.$ Pola readings are given as at 7h. Padova P has been increased by 3m., $SR_1 = +8m.45s.$ Königsberg $SN = +8m.47s.$, $iE = +9m.8s.$ Hamburg $MN = +15.4m.$ Granada $iP = +5m.55s.$, $PR_1 = +8m.31s.$ Stonyhurst P is taken to be at 17h.41m.0s.

Mar. 8d. Readings also at 5h. (La Paz), 11h. (near Batavia), 13h. (Besançon), 14h. (Stonyhurst), 19h. (La Paz), 21h. (Melbourne and Riverview).

Mar. 9d. Readings at 5h. (La Paz and Zagreb (2)), 10h. (La Paz), 22h. (Nagasaki).

Mar. 10d. 11h. 20m. 55s. Epicentre $33^\circ 0'N$, $121^\circ 5'W$. (as on 1920 June 22d.).

A = -438, B = -715, C = +545; D = -853, E = +522;
G = -284, H = -464, K = -839.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Lick	N. 4.3	358	e 1 6	- 1	i 2 1	- 3	—	—
Berkeley	E. 4.9	352	1 18	+ 2	e 2 1	-13	—	2.3
	N. 4.9	352	1 21	+ 5	i 1 59	-15	—	2.3
Tucson	E. 9.0	92	3 59	?S	(3 59)	- 4	5.5	6.8
Victoria	15.4	356	6 41	?S	(6 41)	0	6.8	8.3
Mazatlan	16.5	122	—	—	—	—	9.3	10.8
Tacubaya	E. 24.1	119	6 16	+47	11 8	+82	13.4	15.0
	N. 24.1	119	6 16	+47	11 9	-83	13.7	13.8
St. Louis	25.8	68	e 6 5	+19	13 35	?	e 15.1	15.7
Vera Cruz	26.5	115	(5 37)	-16	—	—	5.6	6.6
Oaxaca	N. 27.4	119	5 18	-44	—	—	14.4	17.0
Chicago	28.1	62	11 3	?S	(11 3)	+ 2	(14.3)	17.1
Ann Arbor	E. 31.0	62	—	—	—	—	18.2	21.1
Toronto	34.3	61	10 11	?	—	—	i 19.4	20.1
Honolulu	N. 34.4	260	—	—	—	—	15.5	17.4
Georgetown	E. 36.1	68	e 13 47	?S	(e 13 47)	+36	e 21.5	22.7
	N. 36.1	68	e 13 47	?S	(e 13 47)	+36	e 21.2	21.3
Washington	36.1	68	—	—	e 13 5	- 6	—	20.2
Cheltenham	E. 36.2	68	—	—	—	—	e 19.1	22.4
	N. 36.2	68	—	—	—	—	e 14.6	22.1
Ithaca	36.3	62	—	—	—	—	18.1	—
Ottawa	37.0	59	—	—	—	—	e 17.1	19.4
Fordham	38.4	64	e 16 59	?	e 20 3	?L	e 22.2	—
Northfield	39.2	59	—	—	—	—	e 20.1	—
Halifax	45.6	58	—	—	e 40 5	?	e 50.6	—
Dyce	N. 76.4	29	—	—	—	—	41.1	—
Edinburgh	76.8	30	—	—	—	—	37.1	45.2
Eskdalemuir	77.2	30	—	—	e 22 5	+14	34.1	41.2
Bidston	78.5	32	24 45	?SR ₁	31 57	?	(36.0)	45.8
Stonyhurst	78.5	32	—	—	—	—	—	41.1
Oxford	80.4	33	—	—	—	—	—	45.5

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
De Bilt	83.0	30	—	—	e 23 11	+14	e 35.1	46.6
Hamburg	83.8	27	—	—	—	—	e 40.1	44.4
Paris	84.2	33	—	—	e 23 0	-10	42.1	44.1
Coimbra	84.2	45	e 16 22	?PR ₁	—	—	39.9	44.4
Königsberg	86.3	20	—	—	—	—	e 46.4	49.0
Strasbourg	E. 86.7	30	—	—	—	—	e 44.6	53.5
Besançon	87.0	32	—	—	22 56	-45	—	47.1
Tortosa	N. 88.9	40	(e 17 5)	?PR ₁	—	—	e 17.1	48.1
Innsbruck	89.2	30	—	—	—	—	e 44.1	—
Barcelona	89.3	38	—	—	—	—	e 32.7	51.9
Moncalieri	89.4	33	e 20 23	?PR ₁	34 45	?	45.6	52.2
Vienna	90.4	25	e 13 11	7	—	—	e 39.9	49.4
Budapest	92.1	25	e 13 11	-17	—	—	e 47.2	—
Pola	92.2	29	—	—	e 24 5?	-32	—	49.9
Zagreb	N.E. 92.3	28	—	—	—	—	39.1	50.3
Algiers	93.1	40	—	—	—	—	e 48.1	51.1

Additional readings and notes : Lick gives also iPN = +1m.12s. and +1m.18s., iPE = +1m.19s., iZ = +1m.46s. Berkeley MZ = +3.7m. Mazatlan readings are given as at 13h. Tucson readings increased by 5m. Tacubaya readings are given as at 7h. Chicago gives S as P and L as S. Ann Arbor LN = +14.9m. Honolulu LE = +17.4m. Georgetown SN = +19m.4s. Cheltenham eN = +19m.14s. Ithaca L = +19.2m. and +21.7m. Fordham ePN = +17m.1s. Northfield L = +23.1m. Bidston P = +26m.29s. De Bilt MN = +48.4m. Hamburg MN = +46.0m., MZ = +51.1m. Coimbra LN = +38.9m. Strasbourg MN = +51.0m. Zagreb MNW = +55.1m. Helwan gives tremors at 12h.

1922. Mar. 10d. 16h. 52m. 15s. Epicentre 22°0S. 180°0.

(as on 1921 April 25d.).

A = - .927, B = .000, C = - .375 ; D = .000, E = +1.000 ;

G = - .375, H = .000, K = - .927.

The observations would be improved by moving the epicentre 0°5S., but the old origin is retained for convenience of comparison. A depth 0.060 of focus below normal is assumed on this occasion. On 1921 April 25d. a depth 0.040 was assumed, and on 1917 May 24d. 19h. some depth was suspected, but none assumed.

	Corr. for Focus	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	-0.9	11.3	45	2 42	-6	i 3 13	-87	3.5	—
Wellington	-2.4	19.8	191	—	—	e 6 27	-60	—	10.2
Christchurch	-2.8	22.4	194	9 39	?S	(9 39)	+84	13.2	16.2
Riverview	-3.5	28.0	239	e 5 17	-16	i 9 48	-6	e 12.6	15.2
Sydney	E. -3.5	28.0	239	5 27	-16	(9 51)	-3	9.8	13.0
Melbourne	-4.1	34.0	234	(e 6 3)	-24	e 6 3	?P	e 18.8	21.4
Honolulu	-5.4	48.4	28	—	—	i 14 12	-36	—	—
Perth	-6.0	57.2	245	—	—	16 31	-3	34.5	—
Manila	-6.7	68.5	297	e 10 30	+6	(19 6)	-20	19.1	—
Tokyo	-6.7	69.1	327	e 10 46	+18	e 13 28	?PR ₁	—	—
Osaka	-6.8	70.7	322	—	—	16 42	?	—	19.8
Mizusawa	E. -6.8	71.1	330	10 42	+2	—	—	—	—
Batavia	-6.9	72.1	270	i 10 53	+7	i 19 35	+8	—	—
Taihoku	-6.9	73.7	306	e 11 10	+13	—	—	—	—
Zi-ka-wei	-7.1	77.3	313	i 11 21	+3	—	—	—	—
Hong Kong	-7.1	78.0	300	11 24	+2	20 35	-2	—	28.1
Berkeley	-7.2	80.7	42	e 11 42	+3	—	—	e 20.7	—
Lick	N. -7.2	80.7	42	i 11 31	-8	—	—	e 20.8	—
Victoria	-7.4	86.7	34	—	—	—	—	14.4	27.2
Colombo	-7.7	102.0	273	22 45	?	—	—	—	—
La Paz	-7.7	102.9	114	e 15 39	?PR ₁	i 23 7	-121	—	—
Chicago	-7.8	106.2	51	24 36	?	28 23	?	—	—

Continued on next page.

		Corr. for Focus	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Georgetown	E.	—	113.4	56	—	—	i 22 58	?	—	—
Washington	—	—	113.4	56	—	—	e 26 19	-98	—	—
Ottawa	—	—	115.4	49	—	—	e 27 53	-20	e 31.2	—
Konigsberg	—	—	143.8	340	18 48	[-59]	e 21 34	? PR ₁	—	25.1
Edinburgh	—	—	146.0	3	(18 57)	[-53]	—	—	—	40.4
Eskdalemuir	—	—	146.6	4	18 54	[-57]	i 28 17	?	i 44.2	—
Hamburg	—	—	147.5	350	i 18 55	[-57]	—	—	e 67.8	—
Stonyhurst	—	—	148.1	3	e 19 15	38	—	—	—	41.2
Bidston	—	—	148.5	4	20 0	6	20 0	? P	—	26.8
De Bilt	—	—	149.7	354	i 19 9	-46	e 22 12	? PR ₁	e 44.6	—
Budapest	—	—	150.3	334	18 42	-24	—	—	—	—
Oxford	—	—	150.3	2	i 19 6	[-50]	i 41 9	?	—	—
Vienna	—	—	150.7	337	i 19 1	[-56]	i 22 28	? PR ₁	—	—
Helwan	—	—	150.9	292	19 7	[-50]	—	—	—	52.7
Uccle	—	—	151.0	353	e 19 1	56	e 22 15	? PR ₁	—	—
Belgrade	—	—	151.7	328	e 19 11	-47	i 22 4	? PR ₁	e 31.7	34.6
Strasbourg	E.	—	152.8	349	19 14	-46	e 22 18	? PR ₁	e 23.8	—
Zagreb	—	—	152.9	335	e 19 9	-51	e 21 45	? PR ₁	—	—
Paris	—	—	153.2	356	e 19 13	-47	—	—	—	—
Pola	—	—	154.5	337	e 19 32	-30	e 26 44	?	e 33.0	33.1
Moncalieri	—	—	156.2	346	e 19 10	-53	26 6	?	33.6	—
Pompeii	—	—	157.6	330	19 26	-40	—	—	42.9	—
Rocca di Papa	—	—	157.6	335	i 18 21	-105	19 45	?	—	—
Barcelona	—	—	160.5	355	e 20 4	4	—	—	e 25.4	25.2
Coimbra	—	—	160.5	19	e 25 45	? PR ₁	36 45	?	47.4	—
Tortosa	N.	—	161.2	359	20 1	[-8]	—	—	e 49.8	53.2
Granada	—	—	164.5	11	19 28	[-44]	29 13	?	—	—
Algiers	—	—	165.0	351	e 19 20	[-52]	24 5	? PR ₁	36.8	—

Additional readings and notes: Christchurch readings are diminished by 1h. Sydney gives also S = -8m.15s. Riverview alternative iS = -9m.56s., T₀ = 16h.51m.49s., Melbourne SR₁ = 11m.15s., SR₂ = 14m.15s., Perth PR₁ = +9m.31s., PR₂ = -12m.20s. Readings are increased by 1hr. Manila S = -16m.8s., Osaka MN = -20.4m., Mizusawa PN = -10m.43s., Batavia i = -23m.0s., Berkeley iZ = 13m.28s., La Paz i = -17m.51s., iSR₁ = -24m.24s., i = -27m.7s., Konigsberg PN = -18m.52s., Edinburgh gives [P] as M., Eskdalemuir iN = +22m.21s., iE? = +40m.34s., Vienna iPE = +20m.7s., iZ = +20m.12s., and +20m.21s., Uccle e = +21m.20s., and +25m.39s., Belgrade PR₁N = +19m.46s., PR₁E = +19m.56s., SR₁N = +22m.28s., SR₁E = +23m.41s., Strasbourg PV = +18m.59s., PN = +19m.12s., eL = +80.8m., Zagreb i = +19m.18s., Granada PR₁ = +20m.30s., PR₂ = +25m.25s., Algiers ? = +27m.58.

Mar. 10d. Readings also at 1h. (La Paz), 4h. (near Manila), 9h. (Kobe, Osaka, and Nagoya), 10h. (St. Louis), 17h. (near Granada), 21h. (near Rocca di Papa), 23h. (Apia).

Mar. 11d. Readings at 0h. (near Osaka and Kobe), 1h. (Tiflis), 6h. (Puebla), 7h., 9h., and 14h. (La Paz), 15h. (Pola and Zagreb, and near Rocca di Papa), 16h. (Zagreb and near Rocca di Papa, Adelaide, and Tiflis), 17h. (La Paz), 18h. (Zurich).

1922. Mar. 12d. 16h. 51m. 45s. Epicentre 38° 0S. 73° 5W.

(as on 1920 Aug. 20d.).

A = +.224, B = -.755, C = -.616; D = -.959, E = -.281;

G = -.175, H = +.590, K = -.788.

		Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz		22.0	14	5 15	+10	e 9 21	+16	i 11.6	13.6
Rio de Janeiro	E.	30.0	69	e 6 23	-5	11 19	-15	16.3	16.8
	N.	30.0	69	e 6 19	-9	11 19	-15	15.8	16.8
Capetown		71.2	119	—	—	20 51	+11	33.6	39.2
Washington		77.0	357	—	—	—	—	e 48.2	—
Ithaca		80.5	358	—	—	—	—	45.2	—
Chicago		80.6	350	11 25	-58	22 22	-8	e 33.2	—
Ann Arbor	N.	80.8	353	—	—	—	—	20.6	—
Toronto		81.8	356	—	—	19 27	?	e 36.0	—

Continued on next page.

	Δ δ	Az. $^{\circ}$	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Ottawa	83.4	359	—	—	i 23 0	- 1	e 36.2	—
Melbourne	96.3	210	—	—	—	—	e 46.8	52.6
San Fernando	97.0	49	—	—	—	—	55.0	59.0
Riverview	97.1	217	—	—	e 24 23	-64	e 46.2	49.2
Victoria	97.1	329	—	—	24 30	-57	37.3	54.0
Rio Tinto	97.6	47	—	?	—	—	—	68.2
Coimbra	98.2	43	15 57	?	e 26 57	+79	e 43.9	57.2
Honolulu	N. 98.9	290	—	—	e 46 24	?	51.5	53.2
Granada	99.0	50	—	—	—	—	e 50.6	53.4
Algiers	102.6	52	—	—	—	—	e 52.2	62.2
Tortosa	N. 103.8	49	—	—	—	—	50.0	63.7
Barcelona	105.2	50	—	—	—	—	e 48.8	57.8
Marseilles	E. 108.1	48	—	—	—	—	e 58.2	—
Oxford	109.5	38	i 28 38	?S	(i 28 38)	+74	—	62.8
Bidston	109.7	37	25 15	?S	(25 15)	-130	(39.3)	66.2
Paris	109.8	41	—	—	i 36 37	?SR ₁	52.2	61.2
Kew	109.9	38	58 15	?L	—	—	(58.2)	70.2
Stonyhurst	110.2	37	e 24 45	?S	—	—	57.8	70.2
Moncalieri	110.5	47	e 28 50	?S	35 46	?	51.5	67.8
Besançon	110.7	45	—	—	—	—	54.2	—
Eskdalemuir	110.8	35	e 19 27	?PR ₁	e 28 52	+77	48.2	63.8
Edinburgh	111.2	34	29 9	?S	40 15	?	58.2	65.4
Rocca di Papa	E. 111.8	51	e 19 15	?PR ₁	—	—	e 56.8	61.4
	N. 111.8	51	—	—	—	—	e 59.8	64.8
Uccle	111.9	40	—	—	e 29 6	+81	—	62.0
Florence	112.0	50	37 50	?	—	—	—	63.2
Strasbourg	E. 112.5	45	—	—	—	—	55.2	66.4
	N. 112.5	45	—	—	—	—	56.2	66.3
Dyce	N. 112.5	32	—	—	—	—	63.2	—
De Bilt	113.0	40	e 19 45	?PR ₁	e 29 27	+93	e 53.2	62.7
Innsbruck	N.E. 113.9	48	—	—	—	—	e 53.4	66.2
Pola	114.1	50	—	—	e 24 15	?	—	71.4
Zagreb	115.9	50	—	—	—	—	53.2	68.5
Hamburg	116.3	40	—	—	—	—	e 60.2	70.4
Athens	117.1	60	—	—	—	—	67.2	73.2
Vienna	117.3	46	—	—	—	—	e 59.2	66.2
Belgrade	N. 118.2	52	—	—	e 61 21	?	e 68.3	72.3
Helwan	118.8	73	e 20 20	?PR ₁	—	—	61.8	75.2
Kodaikanal	141.9	129	71 15	?L	—	—	79.6	81.4
Bombay	145.0	116	69 14	?L	—	—	(69.2)	—
Manila	153.3	213	—	—	—	—	e 84.2	—
Taihoku	E. 161.8	229	—	—	—	—	e 91.8	—
Zi-ka-wei	166.0	245	e 20 9	{ - 3}	—	—	—	52.6

Additional readings and notes: La Paz gives also iS = +9m.32s., T₀ = 16h.51m.52s. Chicago L = +50.2m. Toronto i = +24m.3s., eL = +33.0m. Ottawa eSR₁E = +28m.15s., LE = +38.2m., and +64.2m. San Fernando MN = +59.8m. Riverview MN = +49.5m. Coimbra MN = +57.3m. Honolulu eE = +47m.15s. Granada MN = +58.6m. Algiers MN = +54.8m. Marseilles eLN = +57.2m. Bidston P = +30m.57s., S = +35m.46s. Moncalieri MN = +65.4m. Eskdalemuir e = +34m.52s. Uccle MN = +61.6m. Strasbourg LV = +58.2m. De Bilt MN = +65.3m. Zagreb MNW = 69.6m. Hamburg MN = +65.6m., MZ = +67.6m.

Mar. 12d. Readings also at 11h. (Perth), 12h. (Christchurch, Riverview, Wellington, Adelaide, and Melbourne, also near Taubaya, Vera Cruz, and Oaxaca), 17h. (La Paz), 18h. (Riverview), 19h. (Rio Tinto and near Oaxaca and Taubaya), 20h. (Vera Cruz).

Mar. 13d. Readings at 0h. (La Paz, Simla, Bombay, and Azores), 1h. (La Paz), 5h. (Kobe and La Paz), 13h. and 14h. (La Paz), 15h. (Mizusawa), 16h. (La Paz and near Mizusawa), 18h. (La Paz), 20h. (Tokyo and La Paz), 21h. (Manila and near Zurich).

Mar. 14d. Readings at 1h. and 2h. (Tiflis), 3h. (Azores), 11h. (Zi-ka-wei), 15h. (Manila), 17h. (near La Paz).

Mar. 15d. 3h. 27m. 42s. Epicentre 25°·0N. 2°·0E.

A = +·906, B = +·035, C = +·423 ; D = +·035, E = -·999 ;
G = +·422, H = +·015, K = -·906.

Very rough.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Algiers	11·8	4	—	—	—	—	e 5·7	13·3
Granada	13·1	340	i 3 1	-13	i 5 53	+ 7	6·9	9·8
Tortosa	15·9	356	—	—	—	—	9·3	15·4
Barcelona	16·4	6	—	—	—	e	11·0	12·6
Coimbra	17·5	333	e 4 27	+16	7 55	+27	c 10·9	14·0
Moncalieri	20·5	11	e 4 43	- 1	—	—	10·9	17·0
Zagreb	23·6	24	—	—	—	—	12·3	15·7
Paris	23·8	1	—	—	—	e	12·3	13·3
Strasbourg	24·0	9	—	—	—	—	e 16·3	—
Uccle	25·9	3	—	—	—	e	14·3	—
De Bilt	27·2	4	—	—	—	c	14·3	22·0
Bidston	28·7	354	—	—	16 31?	?L	(16·5)	26·3
Stonyhurst	29·1	355	e 8 48	?PR ₁	—	—	—	19·8
Eskdalemuir	30·5	354	—	—	—	—	16·3	—
Edinburgh	31·1	354	18 18	?L	—	—	(18·3)	—

Additional readings: Algiers gives also e = +6m.38s., i = +7m.40s., and +9m.8s. Granada iSE = +5m.25s. All these readings have been diminished by 7m. Coimbra ePE = 3h.10m.7s., MN = +14·2m., T₀ = 3h.23m.33s.; perhaps the P belongs to a small shock corresponding to one of the readings in the notes to the day. De Bilt MN = +23·5m.

Mar. 15d. 5h. 12m. 35s. Epicentre 39°·0N. 22°·0E.

A = +·721, B = +·291, C = +·629 ; D = +·375, E = -·927 ;
G = +·584, H = +·236, K = -·777.

De Bilt records that the shock was felt at Domokos, which is close to this origin.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	1·7	127	i 0 24	- 2	(i 0 44)	- 4	i 0·7	1·0
Mostar	E. 5·3	326	e 0 55	-27	i 2 28	+ 3	—	2·8
	N. 5·3	326	e 0 57	-25	i 2 35	+10	—	3·0
Belgrade	E. 5·9	344	e 1 29	- 2	e 2 51	+10	—	3·8
	N. 5·9	344	e 1 30	- 1	e 2 57	+16	—	3·8
Rocca di Papa	7·6	294	e 1 43	-12	—	—	i 4·5	5·0
Zagreb	N.W. 8·1	329	e 1 57	- 6	—	—	i 4·6	5·2
Pola	8·4	316	2 7	0	e 4 43	+56	e 5·0	5·4
Budapest	8·8	347	4 17	?L	—	—	(4·3)	—
Padova	9·8	314	3 25	+58	—	—	—	6·9
Vienna	10·0	338	e 2 24	- 6	e 4 13	-16	i 5·3	6·9
Strasbourg	14·0	318	—	—	—	—	7 4	—
De Bilt	17·6	324	—	—	—	—	e 8·0	—

Additional readings and notes: Athens gives also MN = +0·9m., T₀ = 5h.12m.41s. Mostar iPE = +1m.16s., PR₁E = +1m.56s., PR₁N = +2m.5s., readings all increased by 1m. Belgrade ePE = +1m.49s., readings all increased by 2m. Rocca di Papa eN = -1m.49s., readings all increased by 1m. Zagreb iNE = +4m.27s., MNE = +5·0m. Pola MN = +5·2m.

Mar. 15d. Readings also at 2h. (La Paz), 3h. (Colombo, Capetown, Helwan, La Paz, Pompeii, and Rocca di Papa), 4h. (Apia), 9h. (Taihoku), 15h. (near Oaxaca), 21h. (La Paz).

Mar. 16d. 14h. 56m. 50s. Epicentre 6°·0N. 37°·0E. (as on 1919 June 30d.).

A = +·794, B = +·599, C = +·105 ; D = +·602, E = -·799 ;
G = +·083, H = +·063, K = -·994.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Helwan	24·4	348	e 5 32	0	9 47	- 5	—	13·3
Tiflis	36·3	10	—	—	—	—	e 18·2	—
Algiers	43·7	320	—	—	—	—	e 25·8	33·2
Zagreb	43·8	339	e 8 28	+ 4	—	—	24·2	25·2
Vienna	45·7	341	e 8 39	+ 1	—	—	—	—
De Bilt	53·0	337	—	—	—	—	e 28·2	30·0

Zagreb gives also MNW = +28·2m.

Mar. 16d. 18h. 31m. 18s. Epicentre $35^{\circ}0'N$. $143^{\circ}0'E$. (as on 1920 Nov. 8d.).

$A = -.654$, $B = +.493$, $C = +.574$; $D = +.602$, $E = +.799$;
 $G = -.458$, $H = +.345$, $K = -.819$.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo		2.8	285	i 0 39	- 5	i 1 10	- 7	—	1.4
Mizusawa	E.	4.4	340	1 4	- 4	1 48	-13	—	—
	N.	4.4	340	1 3	- 5	1 49	-12	—	—
Osaka		6.2	270	2 0	+25	3 0	+11	—	3.9
Kobe		6.4	266	e 2 0	+22	2 28	-27	3.1	4.1
Zi-ka-wei	Z.	18.4	266	e 4 14	- 8	e 7 50	+ 1	—	12.0
De Bilt		85.4	336	—	—	—	—	e 44.7	54.2
Zagreb		86.1	326	—	—	—	—	46.7	54.7
Uccle		86.7	336	—	—	—	—	e 44.7	—
Bidston		86.8	340	—	—	—	—	—	56.7
Strasbourg	E.	87.4	331	—	—	—	—	49.7	—

Additional readings and notes: Tokyo gives also MN = +1.3m. All these readings have been diminished by 1m. Osaka MN = +3.6m. Kobe MN = +3.3m. De Bilt MN = +54.0m.

Mar. 16d. 23h. 11m. 20s. Epicentre $36^{\circ}5'N$. $122^{\circ}0'W$. (as on 1920 Oct. 5d.).

$A = -.426$, $B = -.682$, $C = +.595$; $D = -.848$, $E = +.530$;
 $G = -.315$, $H = -.504$, $K = -.804$.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Lick		0.9	18	0 11	- 3	i 0 30	+ 5	—	—
Berkeley		1.4	352	e 0 21	0	—	—	e 0.8	1.6
Victoria		11.9	355	—	—	—	—	5.8	7.3
Chicago		27.0	68	—	—	—	—	e 13.3	—
Toronto		32.6	61	—	—	—	—	9.4	—
Washington		35.3	72	—	—	—	—	e 15.3	—

Lick gives also iPZ = +21s., iN = +37s., iE = +39s., iN = +48s., iNE = +50s., and iN = +56s.

Mar. 16d. Readings also at 1h. (Taihoku), 4h. (Vienna, Innsbruck, and Zagreb), 5h. (Taihoku, Manila (2), Zi-ka-wei, Tiflis, Strasbourg, and Port au Prince), 9h. (Riverview), 12h. (near Nagoya), 13h. and 19h. (Mizusawa).

Mar. 17d. Readings at 0h. (near Kobe (2)), 12h. (Budapest), 13h. (Vienna, La Paz, Manila, Riverview, Adelaide, and Melbourne), 14h. (De Bilt), 16h. (La Paz), 17h. (Manila, Riverview, Adelaide, and La Paz), 21h. (Batavia, near Mizusawa, and near Manila), 23h. (near Kobe).

Mar. 18d. 8h. 58m. 0s. Epicentre $37^{\circ}0'N$. $138^{\circ}5'E$. (as on 1920 Feb. 19d.).

$A = -.599$, $B = +.529$, $C = +.602$; $D = +.663$, $E = +.749$;
 $G = -.451$, $H = +.399$, $K = -.799$.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo		1.6	142	i 0 33	- 9	0 39	- 6	i 0.8	0.8
Nagoya		2.2	214	0 45	+11	—	—	1.6	1.8
Mizusawa		2.9	44	0 49	+ 4	1 18	- 2	—	—
Osaka		3.5	227	—	—	1 35	- 2	2.7	3.5

Additional readings: Nagoya gives also MN = +2.4m. Mizusawa SN = +1m.23s. Osaka MN = +3.1m.

Mar. 18d. Readings also at 1h. (near Granada and Malaga), 6h. (La Paz and Tokyo), 7h. (De Bilt and Uccle), 8h. (near Tokyo and Mizusawa), 19h. (Azores), 21h. (near Mizusawa).

Mar. 19d. Readings at 8h. (La Paz), 9h. (Taihoku and Apia), 15h. (Rocca di Papa), 16h. (La Paz), 19h. (Azores).

Mar. 20d. Readings at 0h. (Lick), 8h. (Azores), 15h. (La Paz), 19h. (Tiflis (2) and La Paz), 20h. (near Tacubaya), 21h. (near Tacubaya, Vera Cruz, and Oaxaca).

Mar. 21d. 16h. 56m. 12s. Epicentre $33^{\circ}0'N$. $50^{\circ}0'E$.

A = +.539, B = +.643, C = +.545; D = +.766, E = -.643;
G = +.350, H = +.417, K = -.839.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Helwan	16.3	264	i 3 56	0	7 10	+ 8	—	12.9
Lemberg	25.5	319	—	—	e 10 36	+ 23	—	12.7
Pola	30.2	304	—	—	e 11 39	+ 2	—	19.4
Innsbruck	32.4	309	i 6 53	+ 1	i 12 10	- 4	—	—
Strasbourg	35.0	310	—	—	(e 13 48)	+ 53	e 13.8	—
Hamburg	35.0	320	—	—	e 13 48	+ 53	e 20.4	22.5
De Bilt	37.4	314	—	—	—	—	e 22.8	27.7
Uccle	37.6	312	e 7 35	0	e 16 23	?SR ₁	—	—
Kew	40.6	314	—	—	—	—	—	2.8
Eskdalemuir	42.8	320	—	—	e 14 48	+ 3	23.8	—
Bidston	43.2	317	15 41	?S	(15 41)	+ 50	18.0	28.1
La Paz	122.3	270	41 50	?SR ₁	—	—	—	—

Innsbruck gives also ePNE = +6m.55s.

Mar. 21d. Readings also at 3h. (Mizusawa (2)), 4h. (De Bilt), 10h. (near Mizusawa), 11h. (Sydney and Riverview), 12h. (Adelaide), 18h. (Taihoku and Strasbourg).

Mar. 22d. 22h. 29m. 25s. Epicentre $37^{\circ}5'N$. $90^{\circ}0'W$.

A = .000, B = -.793, C = +.609; D = -1.000, E = .000;
G = .000, H = -.609, K = -.793.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
St. Louis	1.1	352	i 0 14	- 3	i 0 35	+ 4	—	0.7
Chicago	4.6	23	1 53	+ 42	2 33	+ 27	4.0	—
Ann Arbor E.	6.8	43	5 53	?L	—	—	(5.9)	—
Georgetown	10.2	78	—	—	e 4 21	-14	—	—
Washington	10.2	78	5 45	?L	—	—	(5.8)	—
Ithaca	11.4	61	e 5 32	?L	—	—	(e 5.6)	—
Ottawa	13.2	49	—	—	—	—	e 6.3	—

Additional readings: Ann Arbor gives also PN = +6m.23s. Georgetown
eN = +4m.35s. Ithaca S = +6m.1s.

Mar. 22d. Readings also at 0h. (Tiflis), 14h. (Apia), 22h. (St. Louis).

Mar. 23d. Readings at 2h. (St. Louis and Chicago), 3h. (Taihoku), 4h. and 5h. (Porto Rico), 20h. (La Paz).

1922. Mar. 24d. 12h. 21m. 50s. Epicentre 45°·0N. 22°·0E.

A = +·656, B = +·265, C = +·707 ; D = +·375, E = -·927 ;

G = +·656, H = +·265, K = -·707.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Belgrade	1·1	261	i 0 28	+11	i 0 33	+ 2	—	0·8
Sarajevo	2·8	246	i 0 42	- 2	—	—	—	—
Budapest	3·2	321	e 0 56	+ 6	e 1 30	+ 2	—	—
Mostar	3·4	241	e 0 43	-10	i 1 18	-16	—	2·8
Sinj	4·0	253	i 0 52	-10	i 1 35	-15	—	2·0
Zagreb	4·3	283	i 1 14	+ 7	i 1 55	- 3	—	2·2
Lemberg	5·0	15	e 1 52	+35	—	—	e 3·3	5·4
Vienna	5·0	312	i 1 32	+15	2 43	+26	—	3·8
Pola	5·7	271	e 1 34	+ 6	—	—	i 2·9	3·4
Pompeii	6·9	235	2 5	+20	3 0	- 7	—	3·6
Padova	7·1	276	i 21	-27	3 49	+36	3·8	5·7
Athens	7·2	169	2 3	+14	3 42	+27	4·1	4·6
Rocca di Papa	7·5	247	i 1 48	- 6	i 3 16	- 8	—	4·2
Innsbruck	7·7	291	i 2 5	+ 8	e 3 35	+ 6	e 4·3	4·5
Florence	7·8	265	i 57	- 1	3 40	+ 9	—	4·5
Zurich	9·6	289	e 2 27	+ 3	—	—	—	—
Konigsberg	9·9	355	3 4	+35	5 1	+35	e 5·8	8·7
	9·9	355	3 4	+35	5 3	+37	e 6·0	7·8
Moncalieri	10·1	275	2 39	+ 8	4 25	- 7	—	6·6
Strasbourg	10·4	295	i 2 40	+ 4	5 7	+27	5·5	7·0
	10·4	295	—	—	4 58	+18	5·6	7·8
Besançon	11·3	287	2 49?	0	5 41?	+39	6·2	—
Hamburg	11·6	322	e 3 2	+ 9	e 5 24	+15	e 7·1	8·7
Marseilles	12·0	268	e 3 10	+11	5 10	- 9	6·4	—
Uccle	13·1	303	3 20	+ 6	e 6 12	+26	e 7·2	8·7
De Bilt	13·2	308	3 23	+ 7	—	—	7·9	9·2
Puy de Dôme	13·4	280	3 10	- 8	—	—	—	—
Paris	13·8	293	e 3 30	+ 7	6 45	+42	7·6	8·2
Barcelona	14·8	263	e 3 7	-29	e 6 29	+ 2	e 7·2	9·6
Upsala	15·1	352	3 59	+19	7 8	+34	e 8·7	12·2
Kew	16·1	302	9 10	?L	—	—	(9·2)	12·2
Tortosa	16·2	263	e 3 10	-45	—	—	e 8·2	11·0
Algiers	16·4	246	—	—	—	—	9·3	10·7
Oxford	16·8	302	—	—	i 7 19	+ 6	i 9·0	11·0
W. Bromwich	17·4	304	3 51	-18	7 10	-15	8·6	—
Bidston	18·3	306	8 43	?S	(8 43)	+56	(11·3)	13·2
Eskdalemuir	19·0	312	e 4 40	+11	e 8 14	+12	9·6	13·2
Edinburgh	19·2	314	e 4 28	- 3	e 8 14	+ 8	—	13·8
Dyce	19·3	318	—	—	8 29	+21	i 11·7	14·6
Granada	20·7	257	i 5 3	+14	i 8 34	- 4	10·8	11·6
Rio Tinto	22·5	261	10 10	?L	—	—	(10·2)	15·2
Coimbra	22·8	269	5 19	+ 4	9 17	- 4	11·5	14·0
La Paz	101·6	258	14 43	+25	—	—	48·3	—

Additional readings and notes: Belgrade gives also ME = +4·3m. Mostar MN = +2·2m. Zagreb PNE = +1m.17s., i = +1m.26s., and +1m.43s., MNW = +2·4m. Vienna iP = +1m.35s. and +1m.55s. Pola iP = +1m.46s., MN = +3·2m. Athens MN = +6·0m., T₀ = 12h.21m.53s. Rocca di Papa ePN = +1m.52s. Zurich SR₁ = +4m.55s. Epicentre 44°25'N. 20°25'E. Konigsberg LENZ = +6·6m. Moncalieri MN = +6·9m. Strasbourg MZ = +6·6m., P in the table is PZ Hamburg iE = +5m.48s., iN = +6m.0s., MZ = +8·6m., MN = +8·9m. De Bilt MN = +9·1m. Upsala MN = +11·6m. Oxford iL = +9·6m. W. Bromwich e = +3m.47s., i = +4m.16s. Granada iN = +8m.54s., MN = +11·7m. Helwan gives a reading at 12h.

Mar. 24d. Readings also at 3h. (near Mizusawa), 5h. (Nagasaki).

Mar. 25d. Readings at 2h. (near Belgrade (2) and Zagreb), 12h. (near Nagoya, Osaka, and Kobe), 14h. (Zurich), 16h. (Hong Kong), 19h. (near La Paz (2)).

Mar. 26d. 13h. 25m. 32s. Epicentre $41^{\circ}0'S$, $135^{\circ}0'W$.

A = -534, B = -534, C = -656; D = -707, E = +707;

G = +464, H = +464, K = -755.

Very doubtful.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Christchurch		38.2	249	7 40	0	13 40	- 1	17.3	22.5
Apia		41.9	300	16 20	?SR ₁	—	—	18.1	20.4
Riverview		57.3	252	e 21 31	?	e 26 42	?	e 29.2	32.5
Sydney	E.	57.3	252	19 10?	?S	(19 10?)	+70	33.0	34.1
Melbourne		59.7	243	—	—	e 30 10?	?L	(e 30.2)	38.7
Adelaide		65.5	244	—	—	e 32 33	?L	e 37.5	40.0
Honolulu		65.9	338	—	—	—	—	e 32.7	—
Victoria		90.0	8	—	—	—	—	54.4	57.4
Toronto		98.3	37	—	—	—	—	e 75.3	79.0
Batavia		106.4	245	—	—	—	—	e 36.0	—
Zi-ka-wei	Z.	119.4	287	—	—	e 26 6	-159	—	—
Rio Tinto		110.6	79	110 28	?L	—	—	(110.5)	115.5
Uccle		150.5	57	—	—	—	—	e 101.5	—
De Bilt		150.9	54	—	—	—	—	e 101.5	—

Additional readings: Apia gives also P = +17m.28s. All these readings are given as at 14h. Sydney S = 27m.16s. Riverview MN = 32.7m., T₂ = 13h.40m.24s. Melbourne eSR₁ = +33m.22s., L = +37.4?m. Adelaide iL = +38.5m. De Bilt eLN = +102.5m.

Mar. 26d. Readings also at 2h. (Nagasaki), 3h. (near Mizusawa and Osaka), 6h. (near Belgrade), 11h. (Stonyhurst and Batavia), 14h. (near Mizusawa and Tokyo), 15h. (Nagasaki), 23h. (La Paz and near Porto Rico and Port au Prince).

Mar. 27d. Readings also at 0h. (Mizusawa), 10h. (near Tokyo), 17h. (near Padova and Innsbruck), 23h. (Taihoku).

1922. Mar. 28d. 3h. 57m. 50s. Epicentre $21^{\circ}0'S$, $67^{\circ}0'W$.

(as on 1920 June 7d.).

A = +365, B = -860, C = -358; D = -.920, E = -.391;

G = -.140, H = +.330, K = -.934.

A depth of focus 0.010 is assumed. On 1920 June 7 the material was too scanty to give any information about depth of focus.

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
					m. s.	s.	m. s.	s.	m.	m.
La Paz		0.0	4.6	345	i 1 26	+15	2 3	- 3	2.3	6.4
Rio de Janeiro	E.	-0.6	22.2	101	e 5 6	+ 6	9 4	+ 7	—	9.2
	N.	-0.6	22.2	101	i 4 46	-14	8 58	+ 1	11.4	14.0
Balboa Hts.	E.	-0.7	32.4	336	6 28	-16	11 26	-37	—	11.6
	N.	-0.7	32.4	336	—	—	11 42	-21	—	11.8
Porto Rico		-0.8	39.2	2	7 21	-20	i 13 2	-42	16.1	16.6
Vera Cruz		-1.0	49.3	323	9 15	-19	—	—	—	—
Tacubaya	E.	-1.0	51.2	320	9 36	-28	16 45	-24	—	—
Cheltenham	N.	-1.2	60.5	351	i 9 57	-10	i 17 59	-16	27.8	38.9
Georgetown	E.	-1.2	60.6	351	e 10 10	+ 2	i 18 15	- 1	e 28.5	—
	N.	-1.2	60.6	351	i 10 6	- 2	i 18 14	2	38.2	—
Washington		-1.2	60.6	351	12 6	?PR ₁	20 9	?	39.9	—
Fordham		-1.2	62.2	355	e 10 19	0	e 18 33	- 3	e 25.5	—
Ithaca		-1.2	64.0	354	i 10 29	- 2	i 18 55	- 3	e 37.2	—
Ann Arbor	N.	-1.2	65.1	347	14 10	?PR ₁	23 4	?SR ₁	36.0	—
Northfield		-1.2	65.4	357	10 35	4	19 13	- 2	—	—
Toronto		-1.2	65.6	350	10 34	- 7	i 19 34	+16	41.6	—
Chicago		-1.2	65.6	344	10 34	- 7	30 20	?L	42.2	—
Ottawa		-1.2	66.9	354	i 10 46	- 3	19 26	- 7	e 32.2	—

Continued on next page.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Tucson	-1.3	67.8	322	i 10 50	- 5	i 19 36	- 8	33.8	—
Cape Town	-1.3	74.9	121	i 11 43	+ 3	i 21 16	+ 7	—	—
Lick	-1.3	77.8	320	i 11 54	- 4	i 22 34	+51	—	—
Berkeley	-1.3	78.5	320	i 11 55	- 7	i 22 33	+42	—	—
San Fernando	-1.3	81.2	46	12 28	+10	—	—	—	23.7
Rio Tinto	-1.3	81.6	44	14 10	?	—	—	—	37.2
Coimbra	-1.3	82.0	41	12 20	- 3	i 22 31	0	39.7	50.9
Granada	-1.4	83.3	47	i 12 28	- 2	i 22 42	- 3	42.2	50.7
Victoria	-1.4	85.7	327	11 26	-78	i 21 50	-81	45.2	49.1
Algiers	-1.4	87.7	49	e 12 50	- 5	i 23 9	-24	38.2	54.2
Tortosa	-1.4	88.0	45	12 50	- 7	i 23 11	-26	—	—
Barcelona	-1.4	89.3	45	e 12 59	- 5	i 23 16	-35	e 27.4	—
Marseilles	-1.4	92.3	43	—	—	23 46	-37	40.2	—
Bidston	-1.4	92.5	34	17 53	? PR ₁	24 33	+ 8	—	41.7
Oxford	-1.4	92.6	34	e 13 10	-12	i 23 37	-49	30.4	39.2
West Bromwich	-1.4	92.6	33	13 17	- 5	23 34	-52	—	—
Stonyhurst	-1.4	93.1	30	e 0 10	?	i 23 40	-52	—	51.7
Paris	-1.4	93.2	38	e 13 15	-11	i 23 39	-54	33.2	51.2
Eskdalemuir	-1.4	93.4	29	13 17	-10	i 23 39	-56	—	30.6
Edinburgh	-1.4	93.7	30	e 13 13	-16	i 23 37	-61	40.2	50.9
Moncalieri	-1.4	94.3	43	13 19	-13	23 45	-59	34.2	61.2
Besançon	-1.4	94.5	40	—	—	23 49	-57	29.2	—
Dyce	-1.4	95.0	29	—	—	23 46	-66	—	—
Uccle	-1.4	95.1	38	13 20	-16	i 23 49	-64	e 36.2	—
Christchurch	-1.4	95.5	219	11 58	?	16 16	?	24.4	25.8
De Bilt	-1.4	96.1	36	e 13 29	-13	i 23 57	-66	—	—
Zurich	-1.4	96.1	41	e 13 26	-16	e 23 56	-67	—	—
Strasbourg	-1.4	96.1	40	i 13 26	-16	23 56	-67	39.9	52.6
Rocca di Papa	-1.4	96.5	49	i 13 22	-22	e 23 52	-75	—	—
Padova	-1.4	97.4	43	16 52	?	—	—	27.3	28.2
Innsbruck	-1.5	97.8	42	i 13 36	-15	i 24 4	-75	e 36.4	—
Honolulu	-1.5	98.4	290	—	—	25 8	-17	—	87.7
	-1.5	98.4	290	—	—	25 44	+19	—	92.6
Pola	-1.5	98.5	45	—	—	e 24 8	-77	—	27.5
Hamburg	-1.5	99.4	36	13 41	-18	i 24 14	-81	e 42.2	55.2
Zagreb	-1.5	100.2	44	e 13 10	-54	i 24 17	-86	42.2	—
Vienna	-1.5	101.3	40	13 49	-21	i 24 58	-56	e 49.2	67.2
Budapest	-1.5	102.7	44	e 15 10	+54	e 24 14	? PR ₁	27.1	—
Belgrade	-1.5	102.8	47	e 13 51	-26	e 23 45	?	40.5	—
Upsala	-1.5	105.4	31	e 18 33	? PR ₁	i 26 0	-34	45.2	—
Königsberg	-1.5	105.6	37	i 18 42	? PR ₁	24 38	-116	33.2	61.3
Helwan	-1.5	107.2	64	e 18 47	? PR ₁	24 48	-121	57.2	68.3
Riverview	—	114.2	214	e 17 32	?	e 29 5	+61	e 47.6	48.7
Colombo	—	145.0	109	19 40	[- 8]	—	—	—	86.7
Mizusawa	E. —	149.8	305	19 44	[- 12]	—	—	—	—
Batavia	—	152.2	167	19 46	[- 13]	—	—	—	—
Zi-ka-wei	—	168.4	325	i 20 3	[- 11]	e 24 46	?	—	29.8
Manila	—	170.1	239	20 8	[- 7]	—	—	26.0	—
Hong Kong	—	178.2	320	21 53	?	—	—	—	47.3

Additional readings: La Paz readings are given as on 27d. Porto Rico gives also LN = +16.6m. Cheltenham SR₂E = +23m.43s. Ithaca L = +61.7m. Ann Arbor LE = +36.2m. Toronto E? = +5m.46s. Ottawa LE = +41.2m., T₀ = 3h.57m.53s. Lick eN = +15m.37s. (?PR₁). Berkeley iPZ = +11m.53s., iNZ = +11m.56s., iLE = -21.7m., iN = -22m.39s. San Fernando MN = +23.6m. Coimbra eL = +34.2m., T₀ = 3h.57m.57s. Epicentre 19°28.67'0W. Granada PS = +23m.46s. Barcelona PS? = +23m.39s., ? = +24m.41s. Oxford iPR₁ = +17m.39s. Eskdalemuir PR₁ = +16m.54s., iEN = +24m.11s., iN = +25m.36s., SR₁? = +30m.51s., M = +40.3m. Moncalieri MN = +42.5m. Uccle i = +25m.50s. Strasbourg MN = +52.7m. Rocca di Papa iPE = +12m.46s. Honolulu SR₁E = +31m.47s., SR₁N = +32m.0s. San Fernando MN = +23.6m. Hamburg iSN = +24m.15s. Zagreb i = +27m.59s. Vienna iPS = +24m.17s., SR₁? = +32m.33s., all readings given as on 27d. Königsberg SN = +24m.39s., MN = +49.4m., MZ = +61.4m. Riverview eS = +29m.20s., SR₁ = +35m.57s. Mizusawa PN = +19m.42s. Hong Kong gives alternative P at +20m.46s. Upsala iE = +24m.40s., +25m.28s., iSN = -25m.58s., iE = +27m.39s.

Mar. 28d. Readings also at 6h. (La Paz), 15h. (near Sapporo), 16h. (near Mizusawa).

Mar. 29d. Readings at 3h. (near Port au Prince), 5h. (Riverview), 7h. (Manila, Colombo, Batavia, Zi-ka-wei, Zagreb, and near Belgrade), 8h. (Eskdalemuir and De Bilt), 9h. (Zi-ka-wei, Kew, Hong Kong, near Taihoku, and near Tacubaya (2)), 12h. (Oaxaca and Tacubaya), 13h. (De Bilt), 20h. (La Paz and near Belgrade), 21h. (Tortosa).

Mar. 30d. Readings at 3h. (La Paz), 4h. and 5h. (near Belgrade), 9h. (La Paz), 14h. (near Mizusawa), 15h. (Batavia), 17h. (Algiers).

Mar. 31d. Readings at 2h. (La Paz and Port au Prince), 10h. (La Paz, Kew, Eskdalemuir, De Bilt, Uccle, Hamburg, Strasbourg, Edinburgh, Paris, Oxford, and Marseilles), 15h. (near Nagasaki), 17h. (Taihoku), 19h. (Bidston), 20h. (Hong Kong, Zi-ka-wei, and Batavia), 21h. (De Bilt and Uccle).

Constants for New Stations (Nov. 1925).

	°	'	°	'	a	b	c
Abisko	68	20 N.	18	49 E.	+·349	+·119	+·929
Akita	39	41 N.	140	6 E.	-·590	+·494	+·639
Alicante	38	21 N.	0	29 W.	+·784	-·007	+·620
Almeria	36	51 N.	2	28 W.	+·799	-·033	+·600
Amboina	3	42 S.	128	10 E.	-·617	+·784	-·064
Coire	46	51 N.	9	31 E.	+·674	+·113	+·730
Colima	18	12 N.	103	42 W.	-·225	-·923	+·312
Gihu	35	24 N.	136	46 E.	-·594	+·558	+·579
Gorje	46	23 N.	14	5 E.	+·669	+·168	+·724
Hakodate	41	46 N.	140	44 E.	-·577	+·472	+·666
Hokoto	23	32 N.	119	33 E.	-·452	+·798	+·399
Hukuoka	33	35 N.	130	25 E.	-·540	+·634	+·553
Hyderabad	17	26 N.	78	27 E.	+·191	+·935	+·300
Kagosima	31	34 N.	130	33 E.	-·554	+·647	+·524
Kakioka	36	14 N.	140	11 E.	-·620	+·517	+·639
Kyoto	35	4 N.	135	46 E.	-·586	+·571	+·575
Le Mans	48	0 N.	0	13 E.	+·669	+·002	+·743
Lisbon	38	43 N.	9	9 W.	+·770	-·124	+·625
Maebasi	36	24 N.	139	4 E.	-·611	+·527	+·593
Malaga	36	44 N.	4	25 W.	+·799	-·062	+·598
Maron	7	34 S.	111	25 E.	-·362	+·923	-·132
Matuyama	33	50 N.	132	45 E.	-·564	+·610	+·557
Mazatlan	23	11 N.	106	24 W.	-·260	-·882	+·394
Merida	20	57 N.	89	37 W.	+·006	-·934	+·358
Mito	36	23 N.	140	28 E.	-·621	+·512	+·593
Mukaiyama	38	15 N.	140	52 E.	-·609	+·495	+·619
Munich	48	9 N.	11	37 E.	+·653	+·134	+·745
Nagano	36	40 N.	138	12 E.	-·598	+·535	+·597
Naples	40	50 N.	14	16 E.	+·733	+·186	+·654
Niigata	37	55 N.	139	3 E.	-·596	+·517	+·614
Numadu	36	6 N.	138	51 E.	-·608	+·532	+·589
Oaxaca	17	1 N.	96	46 W.	-·113	-·950	+·293
Ootomari	46	39 N.	142	46 E.	-·546	+·415	+·727
Phu-Lien	20	48 N.	106	38 E.	-·267	+·896	+·355
Plymouth	50	22 N.	4	9 W.	+·636	-·046	+·770
Puebla	19	3 N.	98	12 W.	-·135	-·936	+·326
Puy de Dôme	45	46 N.	2	58 E.	+·697	+·036	+·716
Sapporo	43	4 N.	141	21 E.	-·572	+·456	+·683
Sumoto	34	21 N.	134	53 E.	-·583	+·585	+·564
Toledo	39	52 N.	4	1 W.	+·766	-·054	+·641
Travnik	43	13 N.	17	41 E.	+·694	+·221	+·685
Tukubasan	36	13 N.	140	6 E.	-·619	+·518	+·591
Tyosi	35	44 N.	140	51 E.	-·630	+·512	+·584
Upsala	59	51 N.	17	38 E.	+·479	+·152	+·865
Venice	45	26 N.	12	20 E.	+·685	+·150	+·712
Vera Cruz	19	12 N.	96	8 W.	-·101	-·939	+·329

The International Seismological Summary for 1922 April, May, June.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number of the Summary deals with 89 epicentres, 38 of which are new and 51 repetitions from old epicentres. Corresponding figures are, since the beginning of the Summary in its International form :—

	New.				Old.			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
1918	36	44	43	35	44	38	67	53
1919	20	27	31	22	34	41	91	33
1920	24	27	31	27	47	48	49	42
1921	31	29	26	18	30	36	36	47
1922	32	38			36	51		

These figures are, of course, affected by several causes of uncertainty, relating more especially to the smaller shocks. Many of these, recorded only at a single observatory, and relegated to the notes, could perhaps be counted : but there must be many others of similar magnitude which do not reach any existing observatory. Again, others are recorded at more than one observatory, but so imperfectly that not even a rough epicentre can be assigned. The standard of inclusion doubtless varies considerably : for instance, even a small earthquake in Europe or Japan, where observatories are numerous, is fairly sure to be included : but a greater shock which occurs in high latitudes, or perhaps in Africa, will often escape.

The approximate steadiness of the figures therefore must be regarded as sensibly dependent on the present distribution of seismological observatories, and liable to be upset (in the direction of increase, of course) if new observatories can be established.

The following earthquakes deserve special mention :—

1922 April 8d. 20h. 42m. 12s. : 72°·0N. 8°·5W.

This earthquake in a high latitude was well observed in Europe, and the smallness of the numerous residuals is worthy

of attention. There are 41 observatories, which record both P and S with differences O—C as follows :—

	s.	P.	S.
Over	+25	2	6
+25 to +16		2	1
+15 to + 6		3	8
+ 5 to — 4		26	13
— 5 to —14		8	7
—15 to —24		1	4
Under	—24	0	3

The concentration near zero in both P and S is satisfactory. Some of the deviations are due to errors of the tables ; but the observatories are almost all within 50° of the epicentre, so that these errors cannot be fully exhibited. Giving them for what they are worth, we may compare the errors shown by the great Chinese earthquake of 1920 Dec. 16, which was fully discussed in the Summary.

Δ	1922 April 8			1920 Dec. 16		
	δP	δS	No. obs.	δP	δS	No. obs.
	s.	s.		s.	s.	
$10-20$	+2	0	7	+1	+ 4	5
$21-30$	0	+2	13	—9	—14	5
$31-40$	—6	—3	7	—7	+ 2	3
$41-50$	+1	—1	5			

It does not seem easy to trace any close connection between these sets of errors. In particular the large negative corrections to the tables suggested by the 1920 Dec. 16 (China) earthquake for $\Delta=21^\circ-30^\circ$ are not supported by those of the 1922 earthquake, and must be due to something accidental. Such evidence shows us that we are as yet not in a position to adopt new tables. The corrections required by those adopted are small compared with the errors we are liable to meet with in any particular earthquake, and can only be determined from a considerable mass of good material. Meanwhile the adopted tables are good enough for present purposes.

1922 May 11d. 0h. 44m. 32s. : $48^\circ\cdot8S$. $79^\circ\cdot0W$.

May 21d. 15h. 40m. 40s. : $34^\circ\cdot0S$. $73^\circ\cdot0W$.

There was great difficulty in fixing these epicentres, as no observations from S. American stations were available, with the single exception of La Paz. Just as the number was being sent

to Press, however, the much-desired information from Mendoza, Pilar, Cipolletti, Andalgala, Chacarita, and La Quiaca arrived, and, at the expense of some little delay, the identifications were much improved.

Those observers who have not already communicated their readings for 1922 and 1923 are urgently requested to send them without delay to the University Observatory, Oxford.

1922 May 12d. 18h. 39m. 20s.: $22^{\circ}\cdot 0S$. $170^{\circ}\cdot 0E$.

This earthquake is noteworthy from the number of observations of [P] near the anticentre, which may be grouped as follows :

Δ	Individual Results.					Mean.
\circ \circ	s.	s.	s.	s.	s.	s.
140—146	— 3,	— 6,	— 1,	— 3,	— 9	— 3
146—150	{ — 1, +1, +18, +4, (—126) }					+ 5
150—155	+ 23,	+ 7,	+ 22,	— 2,	+ 8	+ 12
155—165	— 27,	— 1,	+ 42,	+ 6		+ 5

It seems doubtful whether any sensible modification of the adopted formula can be inferred from these figures, and it is probable that the focal depth was nearly normal.

There are in fact no cases of abnormal focal depth in the present number, but the details at present to hand concerning the Japanese earthquake of 1925 May 23 promise an important contribution to the problem of depth of focus. Accordant observations at 9 stations (Hong Kong, Manila, Phu-Lien, Hamburg, Vienna, Zagreb, De Bilt, Uccle, and Strasbourg) assign $T_0=2h.9m.38s.$ Times recorded at over 40 stations within 7° of the epicentre (determined locally by Prof. K. Suda as $35^{\circ}\cdot 66N$. $134^{\circ}\cdot 78E.$) give a value for the focal depth (assuming a surface velocity of 5.4 km./sec. according to Jeffreys and Wrinch) of between 100 and 150 km., or between .015 and .023 radius, less than has been suggested (.040) for the normal earthquake. But at La Paz distant 152° from the Epicentre, [P] was received at $T_0+20m.13s.$, or [+14s.] as compared with the adopted formula: suggesting that the focus is at least 75 km. above the normal. The normal depth may thus be 225 km.=.034 radius. A better estimate can be made when all the information is to hand.

H. H. TURNER.

University Observatory, Oxford.
1926 Jan. 26.

1922 APRIL, MAY, & JUNE.

April 1d. Readings at 5h. (Mizusawa, near Tokyo, and near Puebla), 7h. (Batavia and Tortosa), 9h. (near Mizusawa), 14h. (near Belgrade), 15h. (Zagreb), 16h. (Belgrade, Budapest, and Zagreb), 23h. (De Bilt and Bidston).

April 2d. 17h. 0m. 45s. Epicentre $11^{\circ}0'N$. $108^{\circ}0'W$. (as on 1919 Nov. 14d.).

A = -0.303, B = -0.934, C = +0.191; D = -0.951, E = +0.309;

G = -0.059, H = -0.182, K = -0.982.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tacubaya	E.	11.4	44	3 58	-68	5 37	+33	5.9	6.8
	N.	11.4	44	3 55	-65	5 34	+30	5.9	6.3
Puebla		12.4	48	2 20	-45	—	—	3.0	3.1
Vera Cruz		14.0	53	4 11	+45	—	—	4.8	4.9
Berkeley		29.8	337	1 8 41	+75	—	—	e 20.2	—
Chicago		35.5	28	4 33	?	11 43	-80	19.1	—
Ann Arbor	E.	37.8	31	—	—	11 15	?PR ₁	13.5	—
	N.	37.8	31	—	—	11 9	?PR ₁	14.9	—
Georgetown		39.2	40	e 7 15	-33	—	—	e 16.2	—
Washington		39.2	40	—	—	e 12 33	-81	19.9	—
Victoria		39.5	343	—	—	—	—	e 25.0	27.0
Toronto		40.9	32	—	—	—	—	—	19.5
Ottawa		44.0	33	e 4 51	?	e 14 45	-17	e 18.2	—
Northfield		45.0	37	—	—	—	—	e 29.2	—
La Paz		48.1	125	e 8 55	0	e 15 55	0	23.5	25.9
Eskdalemuir		89.1	33	—	—	—	—	37.2	—
De Bilt	E.	95.0	35	—	—	—	—	e 48.2	—
Uccle		95.0	36	—	—	—	—	e 45.2	—
Strasbourg		97.9	37	—	—	—	—	e 40.2	—

De Bilt gives also eLN = +52.2m.

Vera Cruz gives its readings at 11h.

1922. April 2d. 19h. 17m. 42s. Epicentre $53^{\circ}3'N$ $164^{\circ}5'W$.

A = -0.576, B = -0.160, C = +0.802; D = -0.267, E = +0.964;

G = -0.773, H = -0.214, K = -0.598.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Sitka		16.9	65	—	—	—	—	3.0	6.4
Victoria		26.4	84	3 53	-116	7 51	?	8.8	13.7
	Z.	26.4	84	4 53	-56	6 13	?P	9.7	12.7
Honolulu		31.8	169	—	—	(i 12 0)	-5	i 12.0	16.1
Lick	N.	33.4	101	e 6 54	-6	e 12 14	-16	15.2	16.7
Ootomari		33.8	280	31 28	?	—	—	37.8	—
Tueson	E.	43.3	97	e 8 30	-10	—	—	e 21.5	27.4
	N.	43.3	97	—	—	—	—	e 23.7	24.2
Chicago		50.5	70	9 5	-5	16 18	-7	24.4	30.8
St. Louis	E.	51.2	75	e 9 11	0	e 16 29	-5	25.2	—
Ann Arbor	E.	52.4	67	6 21	-178	14 18	-151	19.6	—
	N.	52.4	67	6 30	-172	14 24	-145	19.7	—
Toronto		53.8	63	13 42	?PR ₁	17 48	-42	i 34.4	36.7
Ottawa	E.	54.6	59	9 16	-21	i 17 12	-4	e 25.3	—
Ithaca		56.2	62	e 9 48	1	17 36	0	e 27.3	—
Zi-ka-wei		56.3	279	19 48	0	e 17 32	-6	e 24.3	28.5
Northfield		57.0	58	—	—	e 17 18	-28	33.3	—
Georgetown		58.3	66	e 9 5	-56	18 24	+21	e 30.0	—
Washington		58.3	66	—	—	e 17 36	-27	31.0	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Cheltenham	E.	58.6	66	—	—	—	e	29.2	33.6
	N.	58.6	66	—	—	(e 18 21)	+15	e 18.4	36.7
Tacubaya	E.	59.8	99	10 22	+11	18 29	+ 8	29.9	—
Upsala	E.	66.9	0	—	—	—	e	29.9	48.3
	N.	66.9	0	e 11 0	- 3	e 19 47	- 2	e 34.1	37.2
Hong Kong		67.2	277	10 58	- 1	19 51	- 1	—	42.6
Dyce	N.	68.6	10	11 6	- 2	20 6	- 3	35.0	43.9
Manila		69.2	269	e 11 18	- 6	19 48	-28	31.6	—
Edinburgh		69.8	11	e 11 27	+11	20 22	- 2	29.3	41.8
Eskdalemuir	E.	70.3	11	—	—	—	—	30.8	56.3
	N.	70.3	11	11 21	+ 2	20 33	+ 3	34.3	43.3
Konigsberg		71.8	357	i 11 28	0	20 45	- 3	e 29.6	44.2
		71.8	357	11 29	+ 1	21 10	+22	e 32.2	34.7
Stonyhurst		71.8	11	e 11 36	- 8	20 48	0	—	46.8
Bidston		72.2	11	12 31	60	21 52	+60	—	45.0
Hamburg		73.0	4	e 11 43	+ 7	i 21 1	- 1	e 34.3	49.4
Oxford		74.1	11	—	—	i 21 16	+ 1	32.1	47.7
De Bilt	E.	74.3	7	—	—	—	e	32.3	50.6
	N.	74.3	7	11 46	+ 2	21 18	0	e 34.3	51.1
Kew		74.5	11	18 18	?PR ₁	—	—	—	62.3
Uccle		75.5	8	e 11 52	0	21 29	- 3	e 36.3	38.3
Paris		77.3	9	e 11 18	-45	e 20 53	-59	35.3	47.3
Strasbourg		78.0	6	e 12 4	- 3	22 10	+10	e 47.3	54.4
Vienna		78.5	0	i 12 7	- 3	22 20	+14	e 35.3	40.4
Besançon		79.2	7	—	—	—	—	46.3	—
Innsbruck		79.3	3	i 11 44	-31	22 30	+15	e 39.5	—
Simla		80.1	311	—	—	—	—	e 44.2	—
Porto Rico	E.	80.7	71	—	—	—	e	45.9	49.4
Zagreb		80.9	0	e 12 22	- 2	e 22 28	- 6	e 36.3	50.7
Padova		81.3	2	12 46	+19	22 59	+21	—	—
Moncalieri		81.5	6	12 9	-19	22 23	-18	31.8	56.2
Belgrade		81.8	356	e 12 26	- 3	e 22 39	- 5	30.8	—
Florence		82.9	3	—	—	22 48	- 8	—	50.3
Coimbra	E.	84.3	19	e 12 38	- 6	i 23 5	- 6	e 37.8	51.9
	N.	84.3	19	—	—	—	—	41.8	49.8
Barcelona		84.5	9	e 12 30	-15	e 23 4	-10	e 43.6	50.2
Rocca di Papa	E.	85.0	1	e 12 43	- 5	e 23 3	-16	e 51.7	—
	N.	85.0	1	e 12 45	- 3	—	—	e 57.0	62.3
Tortosa	N.	85.0	11	e 11 18	-90	—	—	e 37.3	63.6
Rio Tinto		87.0	17	47 18	?L	—	—	(47.3)	58.3
Granada		87.2	15	12 16	-44	i 22 44	-59	39.0	49.2
San Fernando	E.	88.2	17	—	—	—	—	—	56.0
Algiers		89.3	9	e 13 0	-12	23 43	-23	e 42.7	59.3
Batavia		94.2	267	e 16 18	?	e 24 47	-11	—	—
Riverview		95.3	217	e 13 30	-15	e 24 9	-60	e 44.6	50.7
Kodaikanal		97.7	300	50 36	?L	—	—	67.1	69.5
Colombo		99.3	295	16 18	?	25 54	+ 5	63.8	65.8
La Paz		106.9	95	e 16 48	?	e 29 48	?	47.6	48.4
Mendoza		119.3	107	26 48	?S	(26 48)	-116	(56.8)	67.5
Cipolletti		123.7	111	73 6	?L	—	—	74.6	78.2

Additional readings and notes: Sitka gives also eN = +1m.57s., eE = -17s., MN = +2.3m. Honolulu PN = 18h.52m.38s., MN = +18.0m. Toronto e = +28m.18s., iL = +32.9m., eL = +58.5m. Ottawa SR₁E = +21m.6s., LE = +32.3m., T₀ = 19h.17m.6s. Ithaca L = +32.3m. Zi-ka-wei PR₁Z = +11m.58s., PR₂Z = +15m.1s. Georgetown ePE? = +8m.22s., LE = +34.3m. Washington L = +37.3m. Hamburg MN = +52.3m. De Bilt eSR₁ = +26m.48s. Uccle SR₁ = +27m.14s., MN = +49.0m. Paris MN = +49.3m. Vienna iE = +13m.48s. Besançon reading has been increased by 1h. Porto Rico eLN = +48.4m. Zagreb MNW = +52.4m. Padova PR₁ = +13m.48s. and +15m.8s., SR₁ = +23m.18s. Moncalieri i = +12m.23s., MN = +55.0m. Barcelona ? = +27m.49s., MN = +53.9m. Rocca di Papa ePN = +12m.18s., iP = +12m.41s. Granada MN = +53.9m. Riverview PS = +24m.44s., MN = +50.4m., T₀ = 20h.18m.18s., all readings being given as for 20h.

April 2d. Readings also at 1h. (Tueson, Taihoku, Vera Cruz, Tacubaya, and Berkeley), 2h. (Victoria), 3h. (Manila), 4h. (De Bilt), 7h. (Barcelona), 8h. and 10h. (La Paz), 16h. (near Mizusawa), 20h. (Budapest), 21h. (Uccle and Moncalieri), 23h. (near Tokyo).

April 3d. 19h. 28m. 40s. Epicentre $20^{\circ}0'N$. $94^{\circ}0'W$.

$A = -.066$, $B = -.937$, $C = +.342$; $D = -.998$, $E = +.070$;
 $G = -.024$, $H = -.341$, $K = -.940$.

Very rough.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
La Paz		44.5	143	8 30	0	i 15 10	+ 1	21.6	27.4
La Quiaca	E.	50.4	147	13 8	?PR ₁	—	—	20.8	23.3
	N.	50.4	147	12 56	?PR ₁	—	—	20.8	25.9
Andalgala	N.	54.6	150	10 44	+67	19 56	+100	19.9	23.8
Mendoza		58.3	156	17 14	?S	(17 14)	-49	26.8	29.4
Pilar		59.2	150	10 26	-20	(17 32)	-41	17.5	20.0
Cipolletti		63.8	160	21 50	?SR ₁	—	—	25.3	26.2
Chacarita		64.2	148	(10 32)	- 7	—	—	10.5	10.7
Stonyhurst		74.9	38	e 48 50	?E	—	—	(e 48.8)	75.8
De Bilt		79.8	38	(e 12 20)	+ 2	—	—	e 12.3	—
Vienna		87.9	38	—	—	e 23 39	-12	—	—
Zagreb		88.8	40	e 20 59	?	22 40	-81	—	23.0
Melbourne		126.3	237	—	—	—	—	38.8	49.6
Manila		131.2	313	21 20	?PR ₁	—	—	—	—
Colombo		152.4	13	53 20	?L	—	—	(53.3)	71.3

Andalgala and Mendoza readings increased by 10 min.

April 3d. Readings also at 0h. (Zi-ka-wei), 2h. (near Taihoku), 4h. and 6h. (La Paz), 7h. (Taihoku and Berkeley), 9h. (Batavia), 14h. (Belgrade and La Paz), 19h. (Colombo), 20h. (De Bilt and Riverview), 21h. (De Bilt and La Paz).

April 4d. Readings at 2h. (Colombo), 10h. (Apia), 12h. (near Tokyo), 15h. (Riverview).

1922. April 5d. 9h. 59m. 15s. Epicentre $2^{\circ}0'S$. $137^{\circ}0'E$.

(as on 1919 July 7d.).

$A = -.731$, $B = +.682$, $C = -.035$; $D = +.682$, $E = +.731$;
 $G = +.026$, $H = -.024$, $K = -.999$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila		23.0	317	e 5 22	+ 5	e 10 10	+45	i 12.6	14.4
Batavia		30.4	261	i 6 32	0	—	—	e 18.8	—
Taihoku		30.9	333	6 34	- 3	(11 33)	-17	11.6	—
Hong Kong		33.0	320	6 52	- 4	(11 56)	-28	11.6	17.2
Adelaide		33.0	176	—	—	i 12 15	- 9	e 17.4	22.0
Riverview		34.5	159	i 7 7	- 2	e 12 21	-27	e 15.0	21.6
Sydney		34.5	159	6 57	-12	12 33	-15	19.0	21.0
Nagasaki		35.4	351	e 6 24	-53	e 11 55	-66	e 15.2	—
Perth		36.0	212	—	—	13 18	+ 8	26.3	—
Zi-ka-wei		36.4	337	e 7 15	-10	e 12 48	-28	e 15.7	19.0
Melbourne		36.5	169	e 7 9	-17	i 13 9	- 8	18.8	21.8
Osaka		36.7	358	7 33	+ 5	12 43	-37	17.7	22.5
Kobe		36.7	359	e 7 39	+11	i 12 41	-39	16.3	21.0
Wellington		52.0	144	e 9 15	- 5	e 16 51	+ 7	e 30.0	—
Christchurch		52.2	148	9 27	+ 6	14 45	-121	21.8	43.4
Calcutta		53.4	300	9 31	+ 2	17 5	+ 4	24.6	—
Colombo		57.8	279	10 3	+ 5	15 27	-149	18.0	19.8
Kodaikanal		60.5	283	25 21	?	—	—	47.2	49.2
Simla		65.7	306	19 57	?S	(19 57)	+24	31.8	—
Honolulu		67.7	64	—	—	(20 1)	- 3	20.0	36.9
Victoria		98.0	12	23 19	?S	31 41	?SR ₁	43.5	49.9
	Z.	98.0	42	—	—	31 55	?SR ₁	45.1	51.6
Berkeley	E.	99.7	52	e 22 58	?	e 26 35	+42	e 45.4	—
Konigsberg	E.	106.6	328	25 16	?S	(25 16)	-101	e 50.8	70.8
	N.	106.6	328	25 2	?S	(25 2)	-115	e 49.8	70.8
Belgrade		109.9	318	e 19 10	?PR ₁	—	—	70.0	—
Vienna		111.4	321	e 19 5	?PR ₁	28 58	+78	e 51.8	71.8

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Zagreb	112.5	319	—	—	—	—	42.8	71.8
Hamburg	112.6	329	e 19 45	?PR ₁	e 29 6	+75	e 52.8	67.8
Innsbruck	N.W. 114.8	323	—	—	—	—	e 59.0	—
Strasbourg	116.4	324	e 27 15	?S	(e 27 15)	-66	60.5	72.4
De Bilt	E. 116.0	330	—	—	e 29 39	+81	e 56.8	68.4
	N. 116.0	330	—	—	—	—	e 54.8	66.9
Dyce	N. 116.0	337	—	—	e 24 52	?	58.5	—
Rocca di Papa	116.3	317	e 24 51	?	31 9	?	e 55.2	76.4
Uccle	117.0	329	e 20 21	?PR ₁	e 29 50	+84	e 51.8	71.4
Edinburgh	117.4	336	—	—	e 29 58	+89	—	69.0
Besançon	118.1	323	—	—	—	—	72.8	—
Moncalieri	118.3	322	—	—	36 45	?SR ₁	60.6	74.6
Stonyhurst	118.4	333	e 20 45	?PR ₁	—	—	—	73.8
Kew	119.0	332	—	—	—	—	—	76.8
Bidston	118.7	334	22 30	?PR ₁	31 15	?	—	70.8
Oxford	119.2	332	20 37	?PR ₁	30 21	+100	50.1	61.6
Paris	119.2	327	—	—	e 27 45	-58	56.8	77.8
Marseilles	120.5	320	—	—	—	—	63.8	—
Barcelona	123.5	320	e 20 38	?PR ₁	36 38	?SR ₁	62.8	69.5
Chicago	123.6	39	20 40	?PR ₁	32 5	?	54.8	—
Tortosa	N. 124.8	320	28 45	?S	e 39 45	?SR ₁	e 57.8	82.1
Algiers	125.2	315	e 20 4	?PR ₁	—	—	e 42.8	79.8
Ann Arbor	E. 125.7	35	—	—	49 21	?	63.6	68.3
	N. 125.7	35	19 39	[+31]	29 57	+25	63.8	68.2
Toronto	127.3	33	28 27	?S	(28 27)	-75	e 68.2	82.8
Ottawa	128.0	29	20 57	?PR ₁	33 43	?	59.8	—
Ithaca	129.7	30	—	—	—	—	65.8	—
Northfield	130.3	26	—	—	e 35 45	?	—	—
Coimbra	E. 130.6	326	e 22 58	?PR ₁	e 39 15	?	59.2	70.9
	N. 130.6	326	e 22 34	?PR ₁	—	—	61.8	75.4
Rio Tinto	131.1	321	29 45	?	—	—	—	94.8
San Fernando	E. 131.6	320	—	—	—	—	—	25.2
Georgetown	E. 131.8	35	e 22 55	?PR ₁	—	—	65.8	—
	N. 131.8	35	e 22 57	?PR ₁	—	—	65.1	—
Washington	131.8	35	e 22 35	?PR ₁	—	—	65.8	—
Cheltenham	E. 132.0	34	—	—	—	—	e 61.1	67.6
	N. 132.0	34	—	—	—	—	e 64.4	71.3
Cipolletti	133.0	153	71 33	?L	—	—	(71.6)	90.8
Mendoza	137.7	148	71 15	?L	—	—	76.2	96.6
Pilar	E. 140.9	151	—	—	—	—	77.0	85.8
	N. 140.9	151	—	—	—	—	77.2	86.8
La Paz	149.0	127	20 8	[+14]	33 32	?	72.0	93.0

Additional readings and notes: Manila gives also MN = +12.8m. Batavia iN = +6m.56s., iE = +17m.42s., i = +12m.57s., and +14m.17s. Hong Kong S = +8m.11s. (?PR₁). Adelaide SR₁ = +13m.39s. Riverview ePR₁ = +8m.32s., +8m.47s., PS = +12m.44s., SR₁ = +14m.3s., MN = +22.0m., MZ = +22.1m., T₀ = 9h.59m.43s. Perth PR₁ = +7m.19s., SR₁ = +18m.40s., SR₂ = +21m.21s. Zi-ka-wei PR₁Z = +8m.57s., MZ = +18.6m., MN = +18.9m. Osaka MN = +22.0m. Kobe MN = +20.2m. Christchurch SR₁ = +19m.33s. Simla SN = +27m.39s., eLE = +22.4m. Honolulu MN = +28.2m. Berkeley iE = +24m.34s., eE = +32m.4s. Konigsberg eZ = +43m.52s. Belgrade e = +20m.27s., +21m.21s., and +33m.2s. Vienna iZ = +19m.42s. Zagreb MNW = +61.8m. Hamburg eSR₁ = +35m.33s., MZ = +67.2m., MN = +73.0m. Strasbourg S = +36m.45s., L = +60.8m., MN = +73.8m. De Bilt ePR₁ = +20m.9s., eSR₁ = +36m.15s. Dyce eN = +25m.42s. and +26m.57s. Rocca di Papa eL = +63.2m. Uccle e = +27m.11s., SR₁ = +36m.45s., eL = +120.8m. Moncalieri MN = +77.4m. All these readings increased by one hour. Bidston P = +28m.15s. Paris e = +29m.45s. Barcelona MN = +84.2m. Chicago L = +60.8m. and +75.8m. Toronto S = +38m.21s., e = +55m.33s., eL = +71.4m. Ottawa PR₁V = +25m.21s., PR₂ = +28m.17s., SR₁N = +41m.15s., SR₂V = +46m.1s., T₀ = 10h.5m.5s. San Fernando MN = +24.0m. Washington L = +71.8m.

April 5d. Readings also at 0h. (Taihoku and La Paz), 1h. (Tiflis), 2h. (La Paz), 3h. (Pilar, Cipolletti, and Mendoza), 4h. (near Algiers), 6h. (La Paz), 9h. (Tokyo), 10h. (Pilar, Cipolletti, and Mendoza), 12h. (La Paz), 13h. (near Manila), 16h. (Marseilles), 19h. (Tiflis), 21h. (La Paz).

April 6d. 3h. 13m. 0s. (I) } Epicentre 14° 0S. 77° 0W.
 Sh. 0m. 45s. (II) }

A = +.218, B = -.945, C = -.242; D = -.974, E = -.225;
 G = -.054, H = +.236, K = -.970.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
I	La Paz	8.9	107	2 14	- 1	4 2	+ 1	4.5	5.4
II		8.9	107	2 13	- 2	4 2	- 1	4.6	5.0
I	La Quiaca	13.5	129	—	—	—	—	8.2	9.5
II		13.5	129	—	—	—	—	19.0	20.2
I	Mendoza	20.5	159	3 54	-53	—	—	10.1	11.1
II		20.5	159	5 33	-46	—	—	12.2	13.4
I	Pilar	20.9	148	4 48	- 4	—	—	10.3	13.8
II		20.9	148	4 45	- 7	—	—	10.8	14.0
II		20.9	148	5 3	+11	—	—	11.0	14.2
I	Cipolletti	26.2	164	11 42	?S	(11 42)	+76	17.0	19.1
II		26.2	164	13 3	?L	—	—	18.8	21.4
I	Chacarita	26.5	144	4 12	-101	—	—	12.2	14.9
II		26.5	144	5 42	-11	(10 0)	-32	10.0	10.6
II		26.5	144	—	—	—	—	8.8	18.4
I	Rio de Janeiro	33.2	110	—	—	—	—	c 17.5	—
II		33.2	110	—	—	—	—	c 16.8	—
I	Georgetown	53.0	0	—	—	e 16 52	- 4	—	—
I	Washington	53.0	0	—	—	e 17 50	+54	—	—
II		53.0	0	—	—	e 17 50	+54	—	—
I	Ann Arbor	56.6	355	—	—	—	—	28.9	—
I	Chicago	56.6	351	i 17 40	?S	(i 17 40)	- 1	32.0	—
II		56.6	351	17 43	?S	(17 43)	- 2	32.8	—
I	Toronto	57.7	358	—	—	—	—	50.6	—
I	Ottawa	59.4	2	—	—	e 18 19	- 3	28.0	—
II		59.4	2	—	—	e 17 51	-25	27.2	—
I	Victoria	74.7	330	39 53	?L	—	—	(39.9)	43.5
II		74.7	330	—	—	—	—	—	43.7
I	Coimbra	83.4	46	12 29	- 9	22 30	-31	40.5	45.6
II		83.4	46	12 42	+ 4	22 44	-17	e 40.8	—
I	Granada	85.7	50	i 12 53	- 1	i 24 48	-81	—	—
I	Barcelona	91.3	48	—	—	—	—	e 47.1	48.7
II		91.3	48	—	—	—	—	e 47.4	—
I	Bidston	92.0	36	—	—	—	—	—	52.2
II		92.0	36	—	—	—	—	—	52.8
I	Oxford	92.4	38	—	—	—	—	—	49.7
I	Eskdalemuir	92.5	33	—	—	24 0	-40	44.0	51.0
II		92.5	33	—	—	e 24 2	-38	45.2	—
I	Edinburgh	92.8	33	46 0	?L	—	—	(46.0)	—
II		92.8	33	46 15	?L	—	—	(46.2)	—
I	Kew	92.9	38	—	—	—	—	—	56.0
II		92.9	38	—	—	—	—	—	66.2
I	Paris	93.8	40	—	—	—	—	e 54.0	55.0
II		93.8	40	—	—	—	—	e 54.2	55.2
I	Marseilles	94.1	47	—	—	—	—	49.0	—
I	Uccle	95.4	39	—	—	e 24 21	-49	e 40.0	—
II		95.4	39	—	—	—	—	—	47.2
I	Moncalieri	96.2	45	—	—	—	—	36.6	—
II		96.2	45	—	—	e 26 17	+59	50.5	—
I	De Bilt	96.3	38	—	—	—	—	e 45.0	50.8
II		96.3	38	—	—	e 24 48	-31	e 41.0	51.8
I		96.3	38	—	—	—	—	e 45.2	50.8
II		96.3	38	—	—	e 24 57	-22	e 41.2	51.9
I	Strasbourg	97.0	41	—	—	—	—	52.5	—
II		97.0	41	—	—	—	—	e 59.2	—
II	Rocca di Papa	99.1	49	—	—	—	—	e 52.4	60.0
I	Hamburg	99.5	37	—	—	—	—	e 50.0	54.0
II		99.5	37	—	—	—	—	e 51.2	55.2
I	Zagreb	102.1	45	—	—	—	—	48.0	56.0
II		102.1	45	—	—	—	—	47.2	57.2
II	Vienna	102.7	42	—	—	—	—	e 54.2	57.6
I	Zi-ka-wei	155.9	318	20 6	[+ 3]	—	—	—	—
II		155.9	318	e 20 8	[+ 5]	—	—	—	—

Additional readings: Rio Janeiro gives also I eN = +17m.0s., II e = +17m.51s.
 Georgetown I eN = +17m.0s., Chicago I PR₁ = +19m.38s., S? = +23m.30s.
 II PR₁ = +19m.42s., S? = +23m.45s., Toronto I L = +58.5m., Ottawa
 I eLE = +25.0m., L = +37.5m., II L = +37.2m., Moncalieri I e =
 3h.12m.33s., II S? = +38m.45s., Zagreb I MNW = +55.0m., II MNW =
 +55.2m.

April 6d. Readings also at 3h. (La Paz and near Granada), 4h. (Colombo), 6h. and 8h. (La Paz), 9h. (Colombo), 11h. (Marseilles), 16h. (Strasbourg), 22h. (Batavia).

April 7d. 6h. 38m. 0s. Epicentre $43^{\circ}8'N$, $11^{\circ}2'E$. (Florence) (as on 1921 May 20d.).

$$A = +.708, B = +.140, C = +.692.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 2	+ 2	—	—	—	0.5
Padova	1.7	17	0 33	+ 7	0 59	+11	—	1.3
Zurich	4.0	332	e 0 50	-12	e 1 33	-17	—	—
Zagreb	4.0	58	—	—	—	—	e 1.8	2.8
Strasbourg	5.3	334	e 2 18	?S	(e 2 18)	- 7	2.7	—

Additional readings: Zurich gives also $iS = +1m.26s$. Zagreb MNW = +2.6m.

April 7d. 15h. 58m. 18s. Epicentre $23^{\circ}5'N$, $119^{\circ}0'E$.

$$A = -.445, B = +.802, C = +.399; \quad D = +.875, E = +.485;$$

$$G = -.193, H = +.349, K = -.917.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Hokoto	0.5	86	-0 18	-26	—	—	0.1	—
Taihoku	2.8	56	e 0 42	- 2	—	—	—	—
Hong Kong	4.6	256	1 33	+22	—	—	—	4.2
Zi-ka-wei	8.0	15	e 2 3	+ 2	e 3 35	- 2	—	4.7
Manila	9.1	168	e 2 24	+ 6	(4 7)	+ 1	4.1	4.9
Nagasaki	13.3	44	e 3 25	+ 8	—	—	e 7.1	—
Batavia	32.0	202	6 28	-19	—	—	—	—
Colombo	41.1	251	16 12	+488	22 42	+500	26.5	30.7
Vienna	80.5	320	e 12 21	- 1	—	—	e 45.7	54.2
Hamburg	81.8	325	—	—	—	—	e 43.7	51.7
Zagreb	81.8	317	e 12 24	- 5	—	—	43.7	54.7
De Bilt	85.1	326	—	—	—	—	e 45.7	48.6
Strasbourg	85.5	322	—	—	—	—	e 47.7	—
Uccle	86.1	324	—	—	—	—	e 45.7	48.7
Edinburgh	86.8	330	—	—	—	—	45.7	56.7
Eskdalemuir	87.2	330	—	—	e 23 42	- 1	41.7	49.6
Moncalieri	87.4	319	e 17 55	?PR ₁	—	—	49.9	—
Kew	88.2	327	—	—	—	—	—	54.7
Bidston	88.3	329	—	—	—	—	—	59.5
Paris	88.3	323	—	—	e 40 46	?	48.7	57.7
Oxford	89.7	327	—	—	—	—	—	58.6
Tortosa	N. 94.1	318	—	—	—	—	e 51.7	54.1

Additional readings and notes: Hong Kong reading is given as on 6d. Zi-ka-wei gives also MN = +4.9m., MZ = +5.5m. Manila MN = +4.5m. Colombo: Are the readings 8 min. in error? Eskdalemuir MN = +57.2m.

April 7d. Readings also at 2h. (near La Paz), 3h. (Zi-ka-wei), 5h. (Tiflis), 8h. (Zi-ka-wei), 12h. (La Paz), 16h. (Taihoku), 18h. and 21h. (near Belgrade).

April 8d. 3h. 32m. 42s. Epicentre $4^{\circ}6'S$, $101^{\circ}6'E$. (as suggested by Batavia).

$$A = -.200, B = +.976, C = -.080; \quad D = +.980, E = +.201;$$

$$G = +.016, H = -.079, K = -.997.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	5.5	107	1 1 24	- 1	1 2 1	-30	—	3.0
Colombo	24.5	298	11 6	?S	(11 6)	+72	15.3	18.8
Manila	27.1	45	e 6 0	+ 1	—	—	e 12.6	—
Kodaikanal	28.2	302	17 54	?L	—	—	(17.9)	—
Hong Kong	29.6	24	7 28	61	—	—	—	18.8
Taihoku	35.4	31	—	—	—	—	e 18.3	—
Zi-ka-wei	40.5	27	7 54	- 5	—	—	—	25.8
Simla	N. 12.6	329	e 14 42	?S	(e 14 42)	- 1	—	—
Adelaide	45.7	136	—	—	—	—	e 26.9	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Melbourne	51.6	136	—	—	—	—	e 26.4	37.8
Riverview	54.4	130	—	—	e 17 4	-10	e 24.7	34.3
Vienna	90.2	319	e 13 21	—	—	—	—	—
Zagreb	90.3	316	e 13 24	—	e 24 12	-5	59.3	—
Rocca di Papa	92.2	311	i 21 26	—	e 30 48	2SR ₁	—	45.3
Strasbourg	96.0	319	—	—	—	—	e 63.3	—
Moncalieri	96.0	315	—	—	e 25 7	-9	e 58.6	—
De Bilt	E. 97.6	321	—	—	—	—	e 62.3	68.0
	N. 97.6	321	—	—	—	—	e 60.3	68.4
Uccle	98.1	320	—	—	—	—	—	58.3
W. Bromwich	101.9	322	21 36	2PR ₁	25 46	-28	—	31.9
Edinburgh	102.1	325	64 18	2L	—	—	(64.3)	—
Eskdalemuir	102.2	325	—	—	e 26 18	+ 1	52.3	—
Bidston	102.4	322	—	—	—	—	—	76.3
Chicago	141.9	11	—	—	—	—	e 82.3	—
La Paz	156.6	205	e 20 18	[+14]	e 34 9	?	78.1	81.1

Additional readings and notes : Colombo gives also S = - 13m.0s. Riverview
 MN = + 33.0m. Simla eE = - 15m.0s. Moncalieri S? = + 38m.33s.
 Chicago L = + 85.9m.

1922. April 8d. 20h. 42m. 12s. Epicentre 72° 0' N. 8° 5' W.

A = - 306, B = - 046, C = - 951 ; D = - 148, E = - 989 ;

G = - 941, H = - 141, K = - 309.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Dyce	N. 15.0	166	i 3 37	- 2	6 12	-20	7.6	9.2
Upsala	E. 15.9	126	e 3 56	+ 5	i 7 4	+11	e 8.5	9.2
	N. 15.9	126	—	—	—	—	e 9.1	9.3
Edinburgh	16.2	169	3 56	+ 1	7 1	+ 1	—	12.1
Eskdalemuir	16.8	170	i 4 5	+ 3	7 20	+ 7	8.6	9.2
Stonyhurst	18.3	168	i 4 8	- 27	—	—	9.3	10.5
Bidston	18.7	170	5 23	+58	8 48	+53	(10.6)	12.8
W. Bromwich	19.6	167	4 38	+ 2	8 13	- 2	10.3	11.8
Hamburg	20.1	147	i 4 47	- 5	i 8 27	- 2	e 12.1	15.1
Oxford	20.5	167	i 4 51	- 4	8 38	+ 4	11.2	16.1
Kew	20.8	166	8 48	2S	(8 48)	+ 8	—	12.8
De Bilt	20.8	156	4 53	+ 2	8 44	+ 4	10.3	17.4
Königsberg	E. 21.1	129	4 59	+ 5	8 44	- 2	e 10.6	12.1
	N. 21.1	129	4 58	—	8 42	- 4	e 10.6	11.9
Uccle	21.8	158	i 5 4	+ 1	9 9	- 8	10.8	12.9
Paris	23.7	162	i 5 22	- 3	9 37	- 1	12.1	17.8
Strasbourg	24.6	151	i 5 35	+ 1	10 4	- 9	e 13.3	19.7
Besançon	25.7	157	e 5 44	- 1	10 10	- 6	13.8	—
Zurich	25.9	153	e 5 43	- 4	e 10 24	+ 4	e 16.1	—
Vienna	26.3	141	e 5 50	- 1	10 56	- 28	e 14.0	18.2
Innsbruck	26.4	149	i 5 51	- 1	e 10 10	-20	e 15.5	20.0
Lemberg	26.5	129	e 6 0	- 7	e 10 48	+16	e 14.2	15.1
Budapest	27.6	138	e 6 5	+ 1	e 7 18	?	e 11.8	—
Moncalieri	28.1	155	6 5	- 4	10 51	-10	14.8	17.8
Padova	28.3	149	6 23	- 12	12 13	-69	15.6	20.3
Zagreb	28.6	143	e 6 12	- 2	11 14	+ 4	e 15.5	18.4
Marseilles	29.5	159	e 6 21	- 2	e 11 22	- 4	14.3	18.8
Florence	29.8	151	5 59	-27	—	—	19.1	19.1
Belgrade	30.4	137	e 6 19	-13	i 11 7	-34	e 15.1	19.0
Barcelona	31.0	165	e 6 16	-22	11 8	-43	e 15.7	17.9
Tortosa	E. 31.5	168	6 34	- 9	11 42	-18	14.6	20.6
Coimbra	N. 31.8	180	e 6 53	- 8	—	—	16.2	18.2
	N. 31.8	180	6 38	- 7	i 11 58	- 7	17.0	17.2
Rocca di Papa	32.0	150	i 6 41	- 6	e 11 0	-68	i 20.8	—
Pompeii	33.2	147	6 53	- 5	12 28	+ 1	19.8	24.8
Rio Tinto	34.2	178	15 18	2L	—	—	(15.3)	21.3
Granada	34.9	174	7 1	-11	i 12 53	- 1	i 17.7	21.5
Azores	35.4	203	16 48	2L	—	—	(16.8)	18.8
San Fernando	35.6	178	7 17	- 1	13 18	+14	—	19.8
Algiers	35.7	164	7 9	-10	13 5	- 1	19.8	20.6

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	37.8	137	e 7 32	- 4	e 13 19	-16	21.4	22.4
	37.8	137	i 7 38	+ 2	i 13 29	- 6	—	25.0
Ottawa	40.1	267	7 53	- 5	11 6	- 7	e 18.8	30.3
Northfield	40.6	263	9 36	?PR ₁	—	—	22.8	—
Toronto	43.1	270	12 24	?	18 12	?SR ₁	e 20.6	24.6
Ithaca	43.4	267	e 10 2	101	11 54	0	19.8	—
Sitka	E. 45.8	323	—	—	—	—	e 20.0	24.9
Georgetown	E. 46.7	265	e 8 18	+ 3	e 15 48	+ 11	e 22.2	—
	N. 46.7	265	e 8 18	+ 3	e 15 52	+15	e 22.0	—
Washington	E. 46.7	265	9 8	- 23	16 30	+53	25.0	—
Cheltenham	E. 46.8	264	—	—	15 43	- 5	25.6	26.7
	N. 46.8	264	8 50	+ 4	15 29	- 9	—	28.8
Helwan	47.2	131	8 52	+ 4	15 50	+ 6	—	32.1
Chicago	47.4	276	8 47	- 3	15 38	- 8	22.6	26.1
St. Louis	51.0	276	i 9 18?	+ 5	13 51	?	20.4	28.1
Victoria	51.3	310	15 38	?	19 35	?SR ₁	23.0	27.9
	Z. 51.3	310	14 48	?	19 18	?SR ₁	26.8	31.6
Denver	54.5	290	—	—	—	—	24.8	26.8
Simla	N. 59.3	83	18 36	?S	(18 36)	+21	35.8	36.9
Berkeley	E. 61.0	306	e 11 6	+47	e 19 6	+30	e 30.3	35.7
	N. 61.0	306	e 10 54	+35	—	—	—	35.7
	Z. 61.0	306	e 10 44	+25	—	—	—	35.5
Lick	N. 61.3	305	—	—	i 23 16	?SR ₁	34.0	38.3
Tucson	N. 63.1	292	—	—	—	—	e 31.9	38.5
Bombay	69.4	92	16 27	?	—	—	—	—
Vera Cruz	71.0	275	—	—	—	—	40.0	—
Zi-ka-wei	71.2	43	11 41	+17	e 21 11	+31	—	46.6
Tacubaya	E. 71.9	277	11 44	+15	21 1	+12	36.0	—
Hong Kong	78.1	53	22 43	?S	(22 43)	+42	—	46.0
Kodaikanal	79.0	91	33 6	?	—	—	49.9	54.0
Colombo	82.9	90	24 48	?S	(24 48)	+112	(36.8)	67.8
Honolulu	E. 84.4	332	—	—	—	—	e 44.6	50.8
	N. 84.4	332	—	—	—	—	e 40.9	49.8
Manila	87.2	49	e 13 26	+26	—	—	12.0	—
La Paz	96.9	236	14 18	+24	e 26 8	+43	49.1	61.7
La Quiaca	101.7	233	56 12	?L	—	—	(56.2)	63.7
Pilar	E. 110.5	228	61 36	?L	—	—	(61.6)	72.1
	N. 110.5	228	61 6	?L	—	—	(61.1)	69.8
Mendoza	112.7	232	60 54	?L	—	—	(60.9)	74.8
Cipolletti	118.4	230	63 54	?L	—	—	(63.9)	78.2
Riverview	140.4	27	e 18 19	?	—	—	e 59.0	77.6

Additional readings: Hamburg gives also MZ = +16.7m., MN = +17.1m.
 De Bilt MN = +14.8m., T₀ = 20h.42m.16s. Königsberg EN = +5m.34s.,
 MZ = +12.3m. Uccle MN = +13.2m. Paris MN = +13.8m.
 Strasbourg iPN = +5m.36s., PS = +10m.30s., MNZ = +17.4m., T₀ =
 20h.42m.8s. Zurich iP = +5m.45s. Epicentre 71° 8N. 8° 9W. Vienna
 iPZ = +5m.51s., PR₂ = +6m.52s., i = +7m.32s., SR₁ = +12m.50s., MN =
 +19.2m. Innsbruck MNW = +21.4m. Moncalieri MN = +18.3m.
 Padova PR₁ = +8m.19s. and +12m.8s. Zagreb ePNW = +6m.11s.,
 i = +6m.16s., iNE = +6m.27s., iPR₂ = +7m.19s., MNW = +27.6m. Mar-
 seilles L = +15.8m. Belgrade PR₁ = +6m.57s. Barcelona PR₁ =
 +7m.24s., ? = +10m.44s. and +11m.44s., MN = +22.3m. Rocca di
 Papa eV = +6m.39s., PR₁ = +8m.24s., iLV = +21.8m. Granada MN =
 +21.2m. San Fernando MN = +21.6m. Algiers MN = +23.3m.
 Athens iN = +9m.28s., T₀ = 20h.42m.26s. Ottawa PR₂ = +9m.34s.,
 SR₁E = +16m.38s., T₀ = 20h.42m.14s. Toronto eL = +22.6m. Ithaca
 eL? = +17.8m. Sitka eN = +28m.34s. Georgetown LE = +25.8m.,
 LN = +26.0m. Cheltenham PR₁N = +10m.39s., SR₁ = +18m.58s.,
 eE = +20m.48s., eN = +21m.19s. Washington L = +29.5m. Simla
 SN = +31m.36s. Berkeley iEN = +33m.8s., iE = +33m.29s.

April 8d. Readings also at 0h. (Manila), 1h. (near Mizusawa), 2h. (near Belgrade and near Tacubaya), 3h. (Vera Cruz), 6h. (Zagreb and Vienna), 7h. (near Belgrade (1)), 10h. (Rocca di Papa and Zagreb), 11h. (Eskdalemuir), 12h. (Riverview and Adelaide), 23h. (Eskdalemuir, Strasbourg, and Uccle).

April 9d. Readings at 1h. (Granada), 6h. (Taihoku and Zi-ka-wei), 13h. (Hamburg, De Bilt, and Eskdalemuir), 14h. (Rocca di Papa), 23h. (Uccle).

April 10d. 3h. 9m. 36s. Epicentre $24^{\circ}0'N$, $123^{\circ}0'E$. (as on 1922 Jan. 10d.).

$$A = -498, B = +766, C = +407.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku	1.7	308	e 0 26	0	—	—	0.8	0.8
Zi-ka-wei	7.3	349	e 1 51	0	e 3 21	+ 3	—	5.0
Manila	9.6	192	—	—	—	—	e 5.4	—
De Bilt	86.7	327	—	—	—	—	e 49.0	56.3

No additional readings.

April 10d. 3h. 54m. 12s. Epicentre $15^{\circ}0'S$, $155^{\circ}0'E$.

$$A = -875, B = +408, C = -259; \quad D = +423, E = +906;$$

$$G = -235, H = -109, K = -966.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	19.1	190	(e 4 34)	+ 4	e 8 10	+ 6	e 10.3	12.4
Sydney	19.1	190	7 48	?8	(7 48)	-16	10.9	12.7
Melbourne	24.5	200	—	—	11 36	?L	14.5	16.8
Adelaide	24.8	213	—	—	10 0	+ 1	e 14.6	18.2
Perth	39.4	236	—	—	13 55	- 2	23.9	—
Manila	44.8	310	e 9 57	+ 85	(16 5)	+ 53	16.1	—
Batavia	48.0	275	e 8 48	- 6	—	—	—	—
Zi-ka-wei	Z.	56.3	326	—	e 18 21	+ 43	—	31.4
Honolulu	E.	58.7	53	—	e 18 28	+ 21	—	—
Victoria		95.8	41	—	—	—	39.8	42.8
Chicago		120.3	49	—	—	—	e 54.8	—
De Bilt	E.	135.9	332	—	—	—	e 57.8	80.6
	N.	135.9	332	—	—	—	e 64.8	76.0
Eskdalemuir		136.4	340	—	—	—	e 60.8	—
Uccle		137.1	332	—	—	—	e 59.8	—
Tortosa	N.	146.0	324	—	—	—	e 75.8	90.4

Additional readings: Riverview gives also $MN = +13.3m$, $MZ = +25.0m$.
 cP is given as ePR₁. Melbourne SR₁ = +13m.0s. Perth PR₁ =
 +7m.10s., SR₁ = +17m.18s. Zi-ka-wei S has been increased by 10m.
 Honolulu cN = -16m.28s. Chicago L = +65.8m.

April 10d. 13h. 57m. 25s. Epicentre $35^{\circ}5'N$, $141^{\circ}0'E$.

$$A = -633, B = +512, C = +581.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	1.1	i 0 5	-12	i 0 13	-18	i 0.3	0.7
Nagoya	3.4	0 47	- 6	(1 31)	- 3	1.5	2.0
Mizusawa	E.	3.6	0 53	- 3	1 51	+ 15	—
	N.	3.6	0 54	- 2	1 52	- 13	—
Kobe		4.9	1 26	+ 10	2 7	- 7	2.6
Osaka		5.3	1 24	+ 2	(2 24)	- 1	2.4

Additional readings: Kobe gives also $MN = +1.3m$. Osaka $MN = +2.7m$.

April 10d. Readings also at 7h. (Kodaikanal and Colombo), 8h. (Zi-ka-wei, Simla, and La Paz), 10h. (near Melbourne and Riverview), 13h. (Colombo), 14h. (near Belgrade), 15h. (Zi-ka-wei and near Mizusawa), 16h. (Taihoku and near Batavia), 17h. (near Mizusawa), 21h. (Cipolletti and Mendoza), 23h. (Colombo).

April 11d. 0h. 18m. 20s. Epicentre $18^{\circ}0'S$. $167^{\circ}0'E$. (as on 1921 Aug. 15d.).

A = -0.927, B = -0.214, C = -0.309; D = +0.225, E = +0.974;
G = +0.301, H = -0.070, K = -0.951.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Apia		20.8	82	4 57	+ 6	9 6	+26	11.0	12.8
Sydney		21.3	219	-0 14	?	—	—	10.2	15.0
Melbourne		27.7	220	6 34	-29	11 52	-58	16.3	20.0
Perth		48.0	243	—	—	16 18	+24	29.8	—
Honolulu	E.	52.2	43	—	—	e 16 42	- 4	26.8	28.1
	N.	52.2	43	—	—	—	—	23.6	30.0
Manila		55.9	303	e 9 55	+10	—	—	—	—
Batavia		59.8	273	e 10 22	+11	e 18 8	-13	—	—
Zi-ka-wei		65.8	318	10 33	-17	e 18 51	-44	—	25.4
Berkeley		86.6	48	—	—	—	—	e 39.5	—
Lick	N.	86.9	48	—	—	—	—	i 42.1	—
Victoria		90.7	39	23 47	?S	28 45	?	e 41.2	45.6
Tucson	E.	93.2	56	—	—	—	—	e 44.1	48.5
Cipolletti		103.2	139	59 28	?L	—	—	61.9	66.2
Mendoza		106.6	134	50 4	?L	—	—	62.5	68.1
Pilar	E.	110.4	135	52 10	?L	—	—	62.0	63.5
	N.	110.4	135	57 10	?L	—	—	62.2	63.7
Chicago		113.2	50	28 23	?S	(28 23)	+27	54.7	—
La Paz		115.7	119	e 25 34	?	37 34	?SR ₁	69.0	74.5
Toronto		119.3	49	e 21 40	?PR ₁	e 36 58	?SR ₁	62.4	72.7
Georgetown		121.2	53	—	—	—	—	e 62.1	—
Washington		121.2	53	—	—	—	—	e 62.7	—
Cheltenham		121.3	53	—	—	—	—	e 62.1	63.8
Ithaca		121.4	49	—	—	—	—	61.7	—
Ottawa	E.	121.7	48	—	—	e 37 18	?SR ₁	64.7	—
Tiflis		125.7	309	e 3 58	?	e 11 1	?	19.7	—
Konigsberg		135.2	333	—	—	—	—	e 70.2	83.2
Hamburg		140.2	339	e 21 40	?	—	—	e 62.7	83.7
Edinburgh		141.4	351	78 40	?L	—	—	(78.7)	—
Vienna		141.5	328	e 19 39	[- 3]	e 22 16	?PR ₁	e 73.7	86.1
Eskdalemuir N.		142.0	351	e 22 24	?PR ₁	e 40 40	?SR ₁	67.7	85.7
De Bilt		143.1	342	—	—	e 22 40	?PR ₁	e 66.7	88.7
Stonyhurst		143.2	350	e 22 40	?PR ₁	—	—	—	96.7
Zagreb		143.3	326	e 22 40	?PR ₁	—	—	61.7	87.7
Bidston		143.7	350	63 20	?L	69 20	?L	(69.3)	83.7
Uccle		144.4	340	—	—	—	—	e 65.7	84.7
Oxford		145.0	347	—	—	—	—	—	90.7
Strasbourg		145.1	336	e 19 42	[- 6]	e 22 47	?PR ₁	e 71.7	—
Kew		145.1	346	—	—	—	—	—	110.7
Florence		147.1	327	80 5	?L	—	—	(80.1)	92.7
Moncalieri		148.0	332	e 44 48	?SR ₁	53 54	?	74.9	—
Tortosa	N.	154.4	336	19 56	[- 5]	—	—	e 71.7	95.6
Algiers		156.5	326	e 20 0	[- 4]	—	—	e 81.7	98.7
Coimbra		157.4	351	20 32	[+27]	34 2	?	e 70.2	—

Additional readings: Melbourne gives also eSR₁ = +13m.28s., SR₂ = +13m.52s.
Perth PR₁ = +9m.28s., SR₁ = +20m.11s., SR₂ = +23m.6s. Batavia i = +19m.31s.
Victoria L = +38.7m. Chicago S? = +34m.15s., L = +64.7m.
Toronto eL = +64.4m. Georgetown LE = +63.8m., LN = +65.0m.
Ottawa LEV = +73.7m. Konigsberg LN = +73.8m.
Hamburg MN = +78.7m. Eskdalemuir eN = +32m.26s. De Bilt MN = +78.9m.
Zagreb MNW = +71.7m. Uccle MN = +89.7m.
Coimbra eL = +83.7m.

April 11d. 4h. 35m. 10s. Epicentre $40^{\circ}5'N$. $19^{\circ}2'E$. (suggested by Zurich).

A = +0.718, B = +0.250, C = +0.649; D = +0.329, E = -0.944;
G = +0.613, H = +0.214, K = -0.760.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mostar	3.0	340	i 0 19	-28	i 1 9	-14	—	2.2
Pompeii	3.6	275	i 10	+14	i 59	+20	—	3.4
Sinj	3.8	330	e 0 15	-44	i 1 8	-36	e 1.6	1.7
Athens	4.4	125	e 1 12	+ 4	i 1 58	- 3	2.1	2.6
Belgrade	4.4	12	i 0 28	-40	i 1 29	-32	—	1.6
Rocca di Papa	5.1	286	e 1 20	+ 1	3 20	?L	(3.3)	3.9

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Zagreb	5.8	337	e 1 37	+ 7	i 3 8	?L	(i 3.1)	5.5
Florence	6.7	302	1 50	+ 8	—	—	—	6.3
Padova	7.3	315	1 35	-16	3 40	+22	4.0	4.8
Vienna	8.0	346	2 8	+ 7	3 36	- 1	i 5.1	6.6
Moncalieri	9.6	302	1 58	-26	4 45	?L	6.0	7.9
Lemberg	9.9	19	—	—	e 4 32	+ 6	e 7.9	8.4
Zurich	10.3	316	e 2 39	+ 5	e 4 36	- 1	—	—
Marseilles	10.7	290	—	—	—	—	5.8	—
Strasbourg	11.5	318	e 3 11	+19	6 27	?L	(6.4)	—
Besançon	11.6	310	5 22	?S	(5 22)	-13	8.8	—
Barcelona	12.9	280	—	—	—	—	e 6.8	11.4
Algiers	13.1	259	e 3 23	- 9	e 7 8	?L	9.1	12.8
Tortosa N.	14.1	278	—	—	(6 27)	+17	6.4	12.5
Königsberg N.	14.4	3	3 28	- 4	5 33	-45	—	10.8
Paris	14.4	311	—	—	—	—	e 8.8	8.8
Hamburg	14.5	338	e 3 48	+15	—	—	9.7	10.8
Uccle	14.6	320	e 3 50	+16	—	—	8.5	9.5
De Bilt	15.1	325	—	—	i 6 57	+23	8.7	10.0
Kew	17.3	316	8 50	?L	—	—	(8.8)	12.8
Granada	18.0	267	i 3 49	-28	i 7 22	-18	e 9.2	12.5
Oxford	18.0	316	4 28	+11	7 56	-16	10.5	12.2
Upsala	19.4	356	4 35	+ 1	8 10	0	e 10.3	12.3
Stonyhurst	19.7	320	e 9 20	?L	—	—	(e 9.3)	14.8
Bidston	19.8	318	2 50	-109	—	—	9.5	15.3
Rio Tinto	20.1	270	12 50	?L	—	—	(12.8)	19.8
Eskdalemuir	20.9	322	e 5 41	+49	e 8 46	+ 4	10.8	12.8
Coimbra E.	21.0	278	—	—	e 8 48	- 4	12.0	18.1
N.	21.0	278	—	—	e 8 12	-32	e 9.3	16.7
Edinburgh	21.2	324	—	—	e 9 2?	+14	—	13.2
Dyce N.	21.7	328	—	—	—	—	13.8	—

Additional readings: Mostar gives also $iPN = +9s$. Athens $P = +1m.20s.$,
 $iP = +1m.25s.$, $MN = +2.9m.$, $T_0 = 4h.35m.24s.$ Belgrade $ePN =$
 $+0m.16s.$, Rocca di Papa $SN = +3m.2s.$ Zagreb $iNW = +1m.44s.$,
and $+2m.20s.$, $i = +3m.20s.$ Padova $PR_1 = +3m.50s.$, $SR_1 = +4m.2s.$
Vienna $PR_1 = +2m.37s.$, $PS = +3m.13s.$, $SR = +4m.22s.$ Moncalieri
 $MN = +8.2m.$ Zurich $iS = +4m.53s.$ Epicentre $40^\circ 5'N$, $19^\circ 2'E$.
Tortosa readings are given as for 3h. Königsberg $PZ = +3m.20s.$ Paris
 $MN = +11.8m.$ Hamburg $ePE = +3m.59s.$, $ePN = +4m.2s.$, $e =$
 $+7m.32s.$, $MZ = +10.7m.$, $MN = +11.2m.$ De Bilt $eE = +7m.24s.$,
 $eN = +7m.38s.$ Granada $MN = +10.4m.$ Upsala $MN = +14.8m.$

April 11d. 15h. 43m. 30s. Epicentre $14^\circ 0'S$, $166^\circ 5'E$. (as on 1921 Oct. 15d.).

A = -0.43, B = +0.227, C = -0.242; D = +0.233, E = +0.972;
G = +0.235, H = -0.056, K = -0.970.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Riverview	24.2	212	e 5 42	+12	e 10 0	-12	e 12.4	14.8
Sydney	24.2	212	10 0	?S	(10 0)	+12	13.9	15.3
Melbourne	30.5	215	—	—	11 30	-13	16.9	19.8
Manila	53.3	300	e 9 52	+24	—	—	—	—
Zi-ka-wei Z.	62.5	319	10 30	- 1	e 18 56	+ 1	—	36.3
Ann Arbor E.	114.0	49	—	—	—	—	62.6	—
Ottawa E.	119.3	44	—	—	—	—	e 64.5	—
Eskdalemuir	137.9	351	—	—	—	—	76.5	—
De Bilt E.	139.1	342	—	—	—	—	e 72.5	—
Uccle	140.5	342	—	—	—	—	e 70.5	—
Strasbourg	141.2	336	—	—	—	—	e 27.5	—

Additional readings: Riverview gives also $MN = -11.1m.$, $T_0 = 15h.43m.54s.$
Melbourne $SR_1 = +14m.0s.$ Ann Arbor $LN = 62.7m.$ De Bilt $eLN =$
 $+74.5m.$

April 11d. Readings also at 2h. (Victoria), 3h. (Vera Cruz), 5h. (Zi-ka-wei),
7h. (La Paz, Mendoza, Pilar, and Cipolletti), 8h. (Eskdalemuir, De Bilt,
Stonyhurst, West Bromwich, Uccle, and Bidston), 9h. (Zi-ka-wei),
10h. (near Tacubaya), 12h. (Riverview), 15h. (near Calcutta), 16h. (near
Tacubaya (2)).

April 12d. 8h. 8m. 25s. Epicentre $39^{\circ}5'N$. $145^{\circ}0'E$. (as on 1921 Sept. 27d.).

$$A = -.632, B = +.443, C = +.636; \quad D = +.574, E = +.819; \\ G = -.521, H = +.365, K = -.772.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	N.	3.0	263	0 57	+10	1 42	+19	—	—
Sapporo		4.6	324	0 36	-35	—	—	1.2	—
Tokyo		5.6	229	e 2 39	?S	(e 2 39)	-5	e 5.0	—
Ootomari		7.4	348	1 22	-30	—	—	2.0	—
Zi-ka-wei	Z.	20.8	254	e 4 51	0	—	—	—	15.2
Uccle		83.3	336	—	—	—	—	e 41.6	—
Strasbourg		84.2	333	—	—	—	—	e 53.6	—
Rocca di Papa		88.0	326	—	—	—	—	e 50.1	52.2

Mizusawa gives also $SE = +1m.40s$. Ootomari readings are reduced by 10m.

April 12d. Readings also at 2h. (near Taebaya). 7h. (near Mostar). 8h. (Zi-ka-wei and Mizusawa), 12h. (Mizusawa and Osaka), 13h. (near Tokyo), 15h. (Strasbourg), 16h., 17h., and 20h. (La Paz).

April 13d. 6h. 7m. 12s. Epicentre $10^{\circ}0'N$. $127^{\circ}5'E$. (as on 1913 April 28d.).

$$A = -.600, B = +.781, C = +.174; \quad D = +.793, E = +.609; \\ G = -.106, H = -.138, K = -.985.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila		7.9	307	e 2 1	+1	—	—	3.4	4.2
Hong Kong		17.7	315	4 8?	-5	—	—	—	9.3
Zi-ka-wei		21.9	346	5 5	+1	e 9 1	-2	—	—
Batavia	E.	26.3	232	i 5 51	0	—	—	—	—
Colombo		47.3	267	26 18	?L	—	—	(26.3)	30.8

Additional readings : Manila gives also $MN = +4.4m$. Batavia $i = +11m.26s$.

April 13d. 15h. 12m. 10s. Epicentre $60^{\circ}0'N$. $110^{\circ}0'W$.

$$A = -.171, B = -.470, C = +.866; \quad D = -.940, E = +.342; \\ G = -.296, H = -.814, K = -.500.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Sitka	E.	13.5	268	e 5 53	?S	(e 5 53)	-3	6.3	6.4
Chicago		22.8	132	e 3 50	?	7 53	-88	—	—
Berkeley		23.5	205	e 6 15	+52	—	—	—	—
Ann Arbor	E.	23.9	126	—	—	9 56	-14	—	10.8
	N.	23.9	126	—	—	9 26	-16	—	13.5
St. Louis		24.7	141	e 5 38	+3	10 2	+5	—	—
Ottawa		24.9	110	e 7 35	+118	i 9 50	-11	e 12.1	—
Ithaca		26.8	116	—	—	e 10 38	-1	—	—
Northfield		27.3	108	—	—	e 10 50	-4	—	—
Georgetown	E.	29.5	121	e 8 12	?	e 12 27	+61	—	—
	N.	29.5	121	e 8 9	?	e 12 23	+57	—	—
Washington		29.5	121	e 5 50	-33	—	—	—	—
Cheltenham	E.	29.7	121	e 10 45	?S	(e 10 45)	-44	12.6	13.3
	N.	29.7	121	e 11 22	?S	(e 11 22)	-7	12.9	13.0
Stonyhurst		52.4	45	—	—	—	—	—	25.8
Bidston		52.5	45	—	—	—	—	—	16.8
De Bilt		56.4	42	—	—	—	—	e 23.8	25.8
Zi-ka-wei	Z.	79.5	317	—	—	—	—	e 28.4	—

Additional readings and notes : Sitka gives also $ePN = +6m.1s$, all readings are increased by 10m. Ottawa $i = +11m.0s$. and $+11m.50s$. De Bilt $MN = +26.1m$.

April 13d. Readings also at 0h. (Apia), 3h. (2) and 5h. (near Tacubaya), 10h. (Riverview and near Mizusawa), 14h. (Tortosa and near Tacubaya), 16h. (Zagreb and Rocca di Papa), 19h. (near Tacubaya), 21h. (near Athens).

April 14d. Readings at 4h. (Apia), 5h. (near Port au Prince).

April 15d. Readings at 0h. (Manila and near Tokyo), 5h. (Apia), 7h. (near Manila and near La Paz), 10h. (Zagreb and near La Paz), 16h. (near Tokyo), 17h. (Rocca di Papa), 21h. (near Mostar), 23h. (Denver).

April 16d. 13h. 7m. 6s. Epicentre $3^{\circ}08'$ S. $24^{\circ}0'E$.

A = +.912, B = +.406, C = -.052; D = +.407, E = -.914;
G = -.048, H = -.021, K = -.999.

Very roughly.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Johannesburg	23.5	171	4 18	-65	—	—	—	10.4
Capetown	31.4	189	—	—	e 11 24	-34	i 14.7	14.9
Helwan	33.6	13	e 7 2	+ 1	12 33	- 1	—	20.4
Algiers	44.3	338	—	—	—	—	e 25.2	32.2
Rocca di Papa	45.9	349	e 8 12	-27	e 16 0	+33	e 31.2	37.5
Granada	47.6	330	9 20	+29	—	—	e 28.8	35.1
Florence	48.1	349	27 24	?L	—	—	(27.4)	36.4
San Fernando E.	48.4	328	—	—	—	—	—	31.9
Barcelona	48.7	340	—	—	c 16 2	0	e 28.8	35.0
Tortosa N.	48.8	337	—	—	—	—	e 24.9	31.8
Zagreb	49.3	354	e 9 4	+ 2	—	—	e 27.9	35.9
Moncalieri	50.1	347	e 9 15	+ 7	16 55	+35	e 30.7	37.2
Vienna	51.6	355	i 9 18	+ 1	i 13 1	?PR ₁	e 34.9	39.4
Coimbra	52.4	330	—	—	—	—	e 31.4	37.7
Besançon	52.7	346	—	—	—	—	—	34.9
Strasbourg	53.5	348	—	—	—	—	e 37.9	—
Kodaikanal	54.8	77	—	—	—	—	24.6	28.7
Paris	55.1	344	—	—	e 24 54	?L	32.9	37.9
Uccle	56.3	348	—	—	—	—	e 24.9	—
Colombo	56.6	80	8 36	-74	14 42	-179	27.2	31.2
De Bilt E.	57.3	349	—	—	—	—	c 33.9	41.8
N.	57.3	349	—	—	e 18 30	+40	e 35.9	44.5
Hamburg	57.8	350	—	—	—	—	e 37.9	—
Konigsberg	57.9	358	—	—	—	—	39.7	—
Kew	58.2	343	35 54	?	—	—	—	40.9
Oxford	58.8	342	—	—	—	—	—	38.7
Bidston	60.8	343	—	—	30 7	?L	(30.1)	44.2
Simla N.	61.0	52	—	—	c 24 24	?	—	—
Stonyhurst	61.0	343	—	—	—	—	—	42.9
Eskdalemuir	62.9	343	—	—	—	—	33.9	44.1
Edinburgh	62.9	343	—	—	—	—	—	44.9
La Paz	91.2	255	e 17 22	?PR ₁	—	—	47.9	58.3
Toronto	101.8	315	—	—	—	—	e 59.8	67.9
Chicago	108.0	313	—	—	—	—	e 53.1	—
Melbourne	112.0	133	e 49 6	?	—	—	54.3	58.1
Riverview	118.2	131	—	—	—	—	c 58.0	64.8
Victoria	126.7	333	—	—	—	—	68.9	78.3

Additional readings: Algiers gives also $i = +26m.54s.$ Rocca di Papa
eP = +8m.36s. Granada MN = +34.3m. San Fernando MN = +35.4m.
Zagreb MNW = +37.9m. Stonyhurst eP = 12h.50m.30s. Toronto
eL = +62.1m. Victoria eL = +76.6m. Riverview MN = +64.9m.

April 16d. Readings also at 1h. (La Paz), 6h. (Zagreb and near Belgrade), 10h. (near Tokyo), 15h. (Azores), 18h. (La Paz), 21h. and 23h. (Manila).

April 17d. Readings at 1h. (Rocca di Papa), 2h. (Manila, Taihoku, and Zi-ka-wei), 5h. (Colombo), 7h. (Ottawa, Ann Arbor, Kingston, and Washington), 14h. (Azores), 15h. (Tortosa), 19h. (Manila), 20h. (near Batavia), 21h. (Manila).

April 18d. Readings at 4h. (Vera Cruz), 5h. (Manila), 8h. (La Paz), 11h. (near Tacubaya), 15h. (near Tiflis and near Belgrade), 17h. (Zagreb and Vienna) 20h. (Tiflis), 21h. (La Paz).

April 19d. Readings at 9h. (near Mizusawa and Puebla), 16h. (Batavia), 19h. (Tiflis, Manila, and Batavia), 22h. (near Belgrade).

April 20d. 5h. 48m. 18s. Epicentre $15^{\circ}5'N$. $101^{\circ}2'W$.

$$A = -.187, B = -.945, C = -.267; \quad D = -.981, E = -.194; \\ G = -.052, H = -.262, K = -.964.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tacubaya	E.	4.3	25	2 14	38	(2 14)	-16	3.3	3.6
	N.	4.3	25	2 10	38	(2 10)	-12	3.3	3.6
Vera Cruz	E.	6.1	52	1 40	+ 7	(2 34)	-12	2.6	3.1
	Z.	6.1	52	1 38	- 5	(2 33)	-13	2.5	2.9
Mazatlan		9.1	329	—	—	—	—	13.6	—
Tucson	E.	18.9	334	11 57	2L	—	—	12.4	12.6
Chicago		28.8	21	6 15	- 1	11 12	- 1	17.7	—
Berkeley		29.1	324	—	—	e 17 52	2L	e 20.6	—
Ann Arbor	N.	30.7	27	—	—	(11 42)	- 4	11.7	—
Washington		31.6	38	—	—	10 42	-79	—	—
Toronto		33.7	30	—	—	—	—	25.8	—
Ottawa		36.7	31	e 7 26	- 2	e 12 57	-23	e 25.7	—
Victoria		37.6	337	—	—	—	—	21.0	24.9
La Paz		45.7	134	8 38	0	—	—	18.2	19.2
Mendoza		57.7	147	20 30	38	(20 30)	+155	22.0	22.9
Cipolletti		62.6	151	20 54	38	(20 54)	+118	22.1	22.9
Chacarita	E.	64.5	142	27 0	2L	—	—	27.7	27.9
De Bilt		87.4	36	—	—	—	—	e 57.7	—

Additional readings: Tucson gives also LN = -12.5m., MN = -15.0m.
Toronto L? = -44.5m.? Chacarita PN = -16m.54s.

April 20d. 10h. 22m. 10s. Epicentre $36^{\circ}0'N$. $21^{\circ}5'E$. (as on 1917 April 27d.).

$$A = +.753, B = +.297, C = +.588; \quad D = +.366, E = -.930; \\ G = -.547, H = -.215, K = -.809.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Athens		2.6	16	i 0 40	- 1	i 1 11	- 1	—	1.2
Belgrade		8.8	355	e 2 12	29	e 3 29	-29	4.2	—
Rocca di Papa		9.0	313	2 14	28	—	—	—	5.8
Helwan		10.2	124	i 2 50	17	—	—	—	2.9
Zagreb		10.8	339	e 3 24	43	e 5 11	-21	e 5.2	6.5
Innsbruck		13.6	329	e 6 8	38	(e 6 8)	-10	—	—
De Bilt		19.9	329	—	—	—	—	e 9.3	—

Additional readings: Belgrade gives also L = +5.4m. Readings all increased by 4m.
Rocca di Papa gives also PN = +3m.38s. Zagreb MNW = +7.0m.

April 20d. Readings also at 3h. and 6h. (2) (La Paz), 7h. (Belgrade), 13h. (Zi-ka-wei (2), Taihoku (3), and Manila), 18h. (near Mizusawa).

April 21d. Readings at 4h. and 6h. (near Tokyo), 10h. (La Paz), 19h. (near Taihoku).

April 22d. Readings at 0h. (Zagreb), 2h. (near Batavia), 8h. (Zi-ka-wei), 10h. (Manila, Zi-ka-wei, and Batavia), 21h. (Colombo, Melbourne, Riverview, Batavia, and Manila).

April 23d. 5h. 4m. 44s. Epicentre $35^{\circ}5'N$, $142^{\circ}5'E$.

A = -646, B = +496, C = +581.

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo		2.2	i 0 34	0	i 1 0	0	—	1.6
Mizusawa	E.	3.8	1 4	+ 5	1 25	-19	—	—
Nagoya		4.5	1 16	+ 6	—	—	—	—
Osaka		5.8	—	—	2 32	- 7	3.5	4.5
Zi-ka-wei	Z.	18.1	e 4 37	+19	—	—	—	12.1

Additional readings: Tokyo gives also MN = -1.4m. Mizusawa SN = +1m.26s.

April 23d. 21h. 30m. 36s. Epicentre $12^{\circ}5'N$, $124^{\circ}5'E$. (as on 1921 May 23d.).

A = -553, B = -805, C = -216; D = +824, E = +566;
G = -123, H = +178, K = -976.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	4.0	302	e 1 2	0	(1 40)	-10	1.7	1.9
Taihoku	12.8	348	e 4 24	+74	—	—	—	—
Hong Kong	13.9	316	3 18	- 7	(6 24)	+18	6.4	6.9
Zi-ka-wei	18.9	352	4 30	+ 2	8 4	+ 4	—	13.3
Osaka	24.3	22	6 33	- 62	—	—	—	11.6
Batavia	25.6	221	i 5 45	+ 1	i 10 2	-12	e 20.4	—
Riverview	52.8	151	e 10 22	+57	e 18 2	+68	e 22.8	27.4
Zagreb	93.5	320	—	—	—	—	e 47.4	61.4
Hamburg	93.9	327	—	—	—	—	e 55.4	—
De Bilt	97.1	327	—	—	—	—	e 49.4	53.8
Strasbourg	97.5	323	—	—	—	—	e 52.4	—
Uccle	98.2	326	—	—	—	—	e 49.4	54.5
Edinburgh	99.0	333	51 24	?L	—	—	(51.4)	—
Eskdalemuir	99.3	333	—	—	e 32 24	?SR ₁	45.4	54.3
Stonyhurst	99.9	330	e 36 24	?SR ₁	—	—	—	58.9
Kew	100.2	329	—	—	—	—	—	63.4
Paris	100.2	325	—	—	e 44 24	?	53.4	54.4
Bidston	100.4	330	—	—	44 54?	?	—	57.4
Oxford	100.7	329	—	—	—	—	51.4	58.6
Rio Tinto	112.1	320	55 24	?L	—	—	(55.4)	60.4
La Paz	167.1	110	20 44	[+31]	—	—	—	—

Additional readings: Zi-ka-wei gives also MZ = +13.7m. Osaka MN = +12.7m. Batavia i = +6m.28s., +7m.27s., and +15m.3s. Riverview MN = 34.4m. All readings given for 24d. Zagreb MNW = +52.4m. De Bilt MN = +52.0m. Eskdalemuir MN = +54.5m. Rio Tinto readings given as on 24d.

April 23d. Readings also at 0h. (Riverview and Zi-ka-wei), 5h. (Zi-ka-wei), 11h. (near Osaka and Kobe), 22h. (Manila).

April 24d. Readings at 2h. (near Tacubaya), 3h. (Vera Cruz), 5h. (Manila), 9h. (Manila and near Athens), 16h. (near Tokyo), 18h. (near Belgrade), 23h. (Lick, Rocca di Papa, Zi-ka-wei, and near Taihoku).

1922. April 25d. 21h. 19m. 0s. Epicentre $13^{\circ}\text{OS. } 166^{\circ}\text{8E.}$

(as on 1920 Dec. 16d.).

A = -949, B = +222, C = -225, D = -228, E = -974;
G = +219, H = -051, K = -974.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Apia	29.8	95	4 50	-1	9 10	+30	(9.2)	12.0
Riverview	25.2	213	e 5 31	-9	e 10 21	+14	e 10.7	14.8
Sydney	25.2	213	5 36	-4	10 12	+5	13.3	14.7
Melbourne	31.5	214	6 30	-13	11 36	-24	15.5	20.0
Adelaide	33.6	224	e 7 0	-1	(i 12 24)	-10	i 12.4	—
Honolulu	48.6	46	—	—	14 18	-103	25.9	47.6
Perth	50.3	239	8 50	-19	16 10	-13	27.3	33.1
Manila	53.2	300	e 9 35	+8	(16 50)	-9	16.8	17.5
Taihoku	58.3	311	—	—	e 18 5	+2	—	—
Batavia	59.4	270	e 10 7	-1	—	—	e 25.0	—
Zi-ka-wei	62.1	316	10 16	-10	e 18 22	-27	—	36.1
Hong Kong	62.5	304	10 20	-9	—	—	—	23.2
Berkeley	83.5	49	—	—	—	—	e 42.5	—
Lick	83.8	50	—	—	—	—	e 41.7	—
Victoria	86.9	36	—	—	(22 14)	-86	e 41.6	45.0
Colombo	88.7	277	24 0	?/2	(24 0)	0	40.0	41.0
Tucson	90.5	57	—	—	—	—	e 44.2	71.9
Kodaikanal	91.6	280	16 36	?PR ₁	—	—	57.6	64.8
Cipolletti	107.0	138	63 18	?L	—	—	(63.8)	—
Mendoza	110.2	133	27 48	?/2	(27 48)	+18	55.3	89.4
Chicago	110.2	49	25 18	?/2	(25 18)	-132	49.0	—
Ann Arbor	113.1	49	—	—	—	—	59.7	62.0
Pilar	114.0	134	31 42	?SR ₁	—	—	58.4	70.8
Toronto	114.0	134	31 18	?SR ₁	—	—	57.5	88.1
Lith Paz	116.1	47	—	—	(30 42)	+143	e 62.0	90.3
Ithaca	118.1	117	—	—	e 28 22	-13	78.9	84.6
Georgetown	118.3	18	—	—	—	—	63.0	—
Washington	118.4	51	—	—	—	—	63.0	—
Ottawa	118.4	51	—	—	—	—	e 62.0	—
Cheltenham	118.4	45	—	—	e 24 50	-227	65.0	—
Johannesburg	118.5	51	—	—	—	—	e 82.8	86.5
Konigsberg	124.0	225	—	—	—	—	60.0	—
Hamburg	130.6	335	i 19 17	[-3]	i 39 14	?SR ₁	e 72.0	74.0
Edinburgh	135.5	340	e 19 24	[-7]	i 39 51	?SR ₁	e 67.0	84.0
Eskdalemuir	136.4	352	76 0	?L	—	—	(76.0)	—
Vienna	137.0	352	22 12	?PR ₁	39 30	?SR ₁	65.0	109.7
De Bilt	137.1	331	19 25	[-9]	34 0	?	—	—
Stonyhurst	E. 138.2	343	e 23 8	?PR ₁	—	—	e 66.0	89.2
Bidston	N. 138.2	343	e 22 22	?PR ₁	—	—	—	83.5
Zagreb	138.3	351	e 23 0	?PR ₁	—	—	—	95.5
Uccle	138.8	349	32 10?	?S	44 24	?SR ₁	—	85.0
Innsbruck	139.0	328	—	—	e 23 0	?PR ₁	83.0	—
Oxford	139.6	343	e 22 30	?PR ₁	—	—	—	80.0
Kew	140.0	334	e 40 4	?SR ₁	e 43 1	?	e 47.4	—
Strasbourg	140.0	349	i 19 50	[+11]	—	—	—	124.5
Paris	140.1	348	—	—	—	—	—	122.0
Florence	V. 140.4	338	e 19 24	[-16]	i 40 1	?SR ₁	e 73.0	104.0
Moncalieri	141.9	345	—	—	e 41 0	?SR ₁	80.0	106.0
Tortosa	142.8	330	93 30	?L	—	—	(93.5)	—
Coimbra	N. 143.4	335	e 20 54	[+68]	29 45	?	—	—
Granada	149.7	339	19 0	[-55]	—	—	e 62.0	—
Rio Tinto	152.5	352	e 7 0	?	e 21 0	?PR ₁	43.0	—
San Fernando	154.3	342	i 20 21	[+20]	28 31	?	(76.0)	96.0
	154.5	348	76 0	?L	—	—	—	—
	155.7	346	20 30	[+27]	—	—	—	117.0

Additional readings and notes: Riverview gives also $PR_1 = +6m.39s.$, $eS = +9m.42s.$, $MN = +14.1m.$, $MZ = +17.7m.$, $T_0 = 21h.19m.13s.$ Melbourne $SR_1 = +13m.54s.$ Honolulu $ePR_1N = +21m.0s.$ Perth $PR_1 = +10m.29s.$, $PR_2 = +11m.40s.$, $SR_1 = +18m.45s.$ Batavia $i = +17m.10s.$, $iN = +19m.1s.$ Zi-ka-wei $MN = +35.8m.$, $MZ = +36.2m.$ Berkeley $eEZ = +29m.55s.$, $eE = +40m.5s.$, $eNZ = +41m.35s.$, $eENZ = +63m.35s.$ Lick $iN = +64m.38s.$ Victoria $eL = +65.3m.$ Colombo $S = +34m.30s.$ Tucson $LE = +54.2m.$ and $+67.1m.$ Chicago $PR_1 = +28m.33s.$, $S = +35m.0s.$, $L = +54.0m.$, $+59.0m.$, and $+69.0m.$ Toronto $eL = +72.4m.$ and $+87.8m.$ La Paz $S = +41m.32s.$ Ithaca $L = +82.0m.$ Georgetown $LN = +65.0m.$, $LE = +86.0m.$ Washington $L = +75.0m.$ Ottawa $eE = +29m.56s.$, $+37m.0s.$, and $+45m.0s.$ Konigsberg $EN = +22m.44s.$, $ENZ = +43m.7s.$ Hamburg $iZ = +43m.25s.$ Eskdalemuir $MN = +85.9m.$ Vienna $PR_1 = +22m.14s.$ Bidston $P = +34m.20s.$ Strasbourg $iV = +43m.0s.$ Paris $MN = +86.0m.$ Florence P has been increased by 2h. Coimbra $LN = +45.0m.$ San Fernando $MN = +90.5m.$

April 25d. 21h. 39m. 30s. Epicentre $13^{\circ}08'$ S. $166^{\circ}48'$ E. (as for previous shock).

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	20.8	95	4 53	+ 2	9 30	+50	—	12.6
Riverview	25.2	213	e 5 52	+12	e 9 54	-13	—	16.5
Melbourne	31.5	214	—	—	12 0	0	16.6	19.5
Manila	53.2	300	e 9 56	+29	(16 42)	-17	16.7	16.9
Batavia	59.4	270	e 10 2	- 6	—	—	e 28.6	—
Budapest	136.3	328	i 21 44	?PR ₁	e 32 33	?	—	—
Edinburgh	136.4	352	116 30	?	—	—	—	—
Vienna	137.1	331	19 24	[-10]	—	—	e 51.5	73.0
Innsbruck	140.0	334	53 57	?L	—	—	(e 54.0)	—
Strasbourg	140.4	338	—	—	—	—	e 52.5	83.5
Moncalieri	143.4	335	20 10	[+24]	31 15	?	56.0	68.0
Tortosa N.	149.7	339	19 51	[- 4]	—	—	—	100.4
Algiers	152.1	332	—	—	—	—	e 73.5	96.5
Granada	154.3	342	i 20 4	[+ 3]	32 17	?	e 66.0	74.7

Additional readings: Riverview gives also PS = +10m.16s., MN = +17.0m.,
 MZ = +17.4m., T₀ = 21h.40m.16s. Melbourne SR₁ = +14m.6s. Batavia
 iN = +17m.29s., i = +21m.55s. Vienna PR₁? = +22m.5s., SR₁? =
 +33m.12s.

April 25d. 22h. 21m. 25s. Epicentre $46^{\circ}0'N$. $149^{\circ}0'E$. (as on 1920 Oct. 18d.).

A = -596, B = +358, C = +719; D = +515, E = +857;
 G = -617, H = +370, K = -695.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Ootomari	4.4	281	(1 8)	0	—	—	1.1	3.0
Mizusawa E.	8.9	223	2 14	- 1	1 1	0	—	—
Tokyo	12.4	218	—	—	—	—	e 7.6	—
Zi-ka-wei	25.9	245	e 5 33	-14	e 10 41	+21	—	17.3
Taihoku	30.3	235	—	—	e 9 25	-131	—	—
Vienna	77.2	330	11 52	-10	—	—	—	45.6

Additional readings: Ootomari gives eP = 22h.17m.52s. Mizusawa SN =
 +4m.4s. Zi-ka-wei MN = +15.8m., MZ = +17.2m. Vienna i =
 +15m.41s.

April 25d. Readings also at 1h. (near Lick), 4h. (near Tokyo), 5h. (Chur and Zurich), 8h. (Manila), 11h. (Florence), 20h. (near Athens), 22h. (near Lick).

April 26d. 1h. 11m. 25s. Epicentre $35^{\circ}0'N$. $139^{\circ}5'E$. (as on 1921 Oct. 2d.).

A = -623, B = +532, C = +574; D = +649, E = +760;
 G = -436, H = +372, K = -819.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	0.7	16	i 0 11	0	i 0 21	+ 1	—	0.4
Nagoya	2.1	274	0 40	+ 7	—	—	—	—
Osaka	3.4	266	0 59	+ 6	—	—	1.8	2.6
Kobe	3.6	266	1 1	+ 5	1 22	-17	2.0	2.3
Mizusawa E.	4.3	17	1 4	- 3	1 52	- 6	—	—
Nagasaki	8.4	257	2 2	- 5	—	—	4.1	4.9
Ootomari	11.9	11	2 43	-15	—	—	4.6	6.1
Zi-ka-wei	15.6	261	i 3 45	- 2	e 6 43	- 3	—	10.4
Taihoku	18.4	242	e 4 20	- 2	(7 54)	+ 5	7.9	—
Hong Kong	25.5	247	5 40	- 3	—	—	—	14.8
Manila	26.4	224	e 6 5	+13	e 10 44	+14	e 12.8	14.1
Honolulu N.	55.8	87	17 29	?S	(17 29)	- 2	24.7	27.6
Riverview	69.7	170	—	—	—	—	e 35.6	—
Upsala	73.9	334	e 11 35	- 6	21 1	-12	e 40.2	48.5
Konigsberg N.	76.1	329	—	—	i 21 27	-11	e 40.6	46.6

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Hamburg	81.3	333	i 12 16	-11	e 22 35	-3	e 43.6	48.6
Vienna	82.6	326	12 23	-11	e 21 33	-80	—	53.1
Edinburgh	83.7	340	—	—	—	—	—	49.6
Eskdalemuir	84.2	340	—	—	—	—	38.6	53.7
De Bilt	84.2	334	—	—	22 52	-18	e 43.6	49.6
E. N.	84.2	334	—	—	—	—	e 46.6	53.4
Zagreb	84.5	324	—	—	—	—	42.6	—
Stonyhurst	85.3	339	e 51 35	?L	—	—	(e 51.6)	55.1
Uccle	85.5	334	e 12 38	-13	e 23 0	-25	e 43.6	—
Innsbruck	85.5	328	(e 12 47)	-4	e 12 47	?P	—	—
Bidston	85.8	339	—	—	42 12?	?L	(42.2)?	55.6
Strasbourg	86.1	330	—	—	—	—	e 46.6	—
Kew	86.6	337	—	—	—	—	—	50.6
Oxford	87.0	337	—	—	—	—	—	52.0
Paris	87.9	333	—	—	—	—	e 48.6	53.6
Florence	88.2	325	47 5	?L	—	—	(47.1)	50.6
Moncalieri	88.9	328	—	—	e 41 15	?L	50.2	—
Chicago	91.9	338	—	—	e 23 5	-89	47.6	—
Ottawa	93.6	23	—	—	—	—	e 48.6	—
Tortosa	N. 95.3	330	e 23 35	?S (e 23 35)	—	-94	e 49.6	65.0
Coimbra	99.2	335	e 32 35	?SR ₁	—	—	72.6	—
La Paz	149.2	60	18 52	[-62]	—	—	72.4	—

Additional readings and notes: Osaka gives also MN = -2.7m. Kobe MN = +2.2m. Mizusawa SN = +1m.53s. Zi-ka-wei PSZ = +7m.7s. Manila MN = -13.7m. Honolulu S = -21m.51s. Vienna PR₁Z = +15m.58s., i = +23m.59s. and +24m.11s. Eskdalemuir e = +11m.5s., +14m.29s., +22m.45s., and +28m.27s., MN = +53.5m. Stonyhurst eP (=L) has been increased by 1h. Toronto (Δ = 93°7), L = 1h.11m.54s. and 1h.13m.36s. Coimbra readings have been increased by 1h.

April 26d. 3h. 59m. 0s. Epicentre 45°3N. 153°5E. (as on 1920 Sept. 21d.).

A = -630, B = -314, C = -711; D = -446, E = -895;
G = -636, H = -317, K = -703.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ootomari	7.6	284	1 58	+3	(3 33)	+7	3.6	4.6
Tokyo	14.2	232	i 4 0	+31	i 8	?L	e 11.1	26.5
Nagoya	16.1	237	3 37	-16	—	—	—	—
Osaka	17.4	239	4 21	+11	11 14	?	—	17.5
Kobe	17.6	239	e 4 28	+16	e 11 20	?	16.2	17.7
Nagasaki	22.1	244	5 20	+14	(9 24)	+17	(11.2)	—
Zi-ka-wei	28.6	252	i 6 11	-3	e 11 3	-7	e 15.5	24.3
Taihoku	32.7	242	—	—	e 14 10	?	19.4	—
Hong Kong	39.4	245	7 40	-10	—	—	—	31.5
Manila	41.2	233	e 8 14	+9	—	—	16.4	—
Honolulu	46.1	103	15 39	?S	(15 39)	+10	26.5	30.2
Victoria	54.1	55	—	—	16 23	-47	22.8	36.2
N. Simla	59.4	285	16 18	?	30 12	?L	e 38.5	38.8
Berkeley	60.5	65	—	—	e 16 25	?	e 25.0	—
Lick	60.9	65	—	—	e 15 41	?PR ₁	i 24.9	—
Batavia	66.2	233	—	—	e 16 54	?	i 25.8	—
Upsala	68.9	338	11 12	+2	20 11	-2	e 35.2	51.1
Konigsberg	72.3	334	i 11 29	-3	20 52	-2	e 37.7	51.8
Tiflis	72.3	313	—	—	—	—	e 44.0	—
Kodaikanal	73.0	269	26 0	?SR ₁	—	—	48.6	56.6
Lemberg	75.3	330	e 12 0	+9	—	—	e 38.2	54.0
Hamburg	76.4	339	e 11 56	-1	i 17 58	?PR ₁	e 39.0	49.0
Edinburgh	77.0	348	22 0	?S	(22 0)	+11	—	—
Chicago	77.3	42	20 26	?S	(20 26)	-86	36.2	—
Eskdalemuir	77.5	348	e 12 3	-1	i 21 54	-1	38.0	57.4
N. Ann Arbor	78.7	39	—	—	—	—	53.4	74.5
Stonyhurst	78.8	346	e 18 30	?PR ₁	28 12	?SR ₁	49.6	53.5
De Bilt	78.9	340	e 12 14	+2	22 8	-3	e 42.0	51.4
Budapest	79.1	330	e 12 47	+33	i 18 14	?PR ₁	e 28.0	—
Riverview	79.2	182	e 12 12	-2	—	—	e 41.3	56.5
Bidston	79.3	346	12 20	+5	19 14	?	—	38.6
Vienna	79.3	333	e 12 16	+1	22 33	+18	e 44.0	53.0
Toronto	79.4	36	—	—	e 33 12	?	e 51.5	55.8
E. Ottawa	79.5	32	—	—	e 22 4	-14	e 43.0	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Uccle	80.3	341	e 12 17	- 4	e 22 22	- 5	e 40.0	52.9
Oxford	80.6	346	17 25	?PR ₁	i 22 30	0	—	61.6
Kew	80.6	345	—	—	—	—	—	62.0
Zagreb	81.5	331	—	—	—	—	e 46.0	54.0
Strasbourg	81.6	338	i 12 20	- 8	22 34	- 8	38.0	55.8
Innsbruck	81.6	336	e 12 27	- 1	e 22 38	- 4	e 43.9	58.4
Ithaca	81.9	35	—	—	—	—	51.0	—
Paris	82.6	342	—	—	e 28 42	?SR ₁	44.0	53.0
Besançon	83.2	339	—	—	e 29 26	?SR ₁	47.0	—
Georgetown	84.3	37	e 15 24	?	23 6	- 5	e 29.1	—
Washington	84.3	37	e 18 30	?PR ₁	—	—	e 54.0	—
Moncalieri	84.8	337	12 41	- 6	22 59	-18	32.0	60.5
Florence	84.9	334	13 0	+13	—	—	—	61.0
Rocca di Papa	86.3	332	—	—	—	—	55.5	70.0
Helwan	88.4	314	i 13 3	- 4	29 30	?SR ₁	56.5	63.6
Tortosa	N. 90.6	341	e 18 0	?PR ₁	—	—	e 48.0	60.8
Coimbra	93.1	347	—	—	e 47 30	?L	71.0	86.5
Algiers	93.8	337	—	—	—	—	e 55.0	60.0
Rio Tinto	95.0	346	57 0	?L	—	—	(57.0)	64.5
Granada	95.0	343	17 43	?PR ₁	—	—	e 53.3	60.5
San Fernando	E. 96.3	345	—	—	—	—	—	75.0
La Paz	134.9	62	e 19 59	[+29]	e 34 9	?	71.8	87.8

Additional readings and notes: Ootomari gives also MN = +4.1m. Kobe MN = +18.9m. Nagasaki gives its L as the P of another shock, for which the L = +15.4m. Zi-ka-wei SR₁Z = +13m.24s., MN = +21.9m., MZ = +29.5m. Honolulu S = +21m.31s., MN = +21.8m. Berkeley eE = +16m.35s. Upsala i = +17m.11s., MN = +53.8m. Konigsberg PR₃? = +17m.38s., PSN = +21m.41s., iN = +27m.47s., MNZ = +52.0m. Hamburg MN = +54.9m., MZ = +56.0m. Chicago S = +27m.42s., L = +45.0m. Eskdalemuir e = +18m.2s., i = +27m.52s., MN = +61.1m. Ann Arbor LE = +49.5m. All readings increased by 1h. De Bilt SR₁ = +23m.7s., MN = +58.9m. Riverview MN = +49.0m. Bidston P = +13m.15s. Vienna iPZ = +12m.17s., PR₂ = +18m.15s., i = +20m.8s., SR₁ = +28m.58s., eLZ = +46.0m., MZ = +58.0m. Toronto eL = +57.3m. Ottawa eE = +18m.48s. and +28m.8s., e = +74m.52s. Uccle e = +18m.18s., MN = +59.7m. Oxford i = +28m.28s. Strasbourg MN = +50.0m. Innsbruck PR₁ = +18m.27s., SR₁NW = +28m.37s., MNW = +50.9m. Paris MN = +60.0m. Washington L = +66.0m. Moncalieri MN = +57.7m. Helwan PR₁? = +23m.33s. Coimbra all readings have been increased by 1h. Granada MN = +64.0m. San Fernando MN = +64.0m. La Paz L = +80.8m.

April 26d. Readings also at 0h. (Riverview), 2h. (Granada and near Tokyo (2)), 3h. (near Tokyo (2) and near Athens), 4h. (Tokyo, Mizusawa, and near Tacubaya), 5h. (Mendoza, Pilar, Mazatlan, and near Tokyo), 19h. (Manila), 20h. (Zi-ka-wei), 23h. (Colombo).

April 27d. 9h. 15m. 30s. Epicentre 40°-0N. 138°-0E.

A = -569, B = +513, C = +643; D = +669, E = +743;
G = -478, H = +430, K = -766.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E. 2.6	110	0 42	+ 1	1 11	+ 2	—	—
Nagoya	4.9	190	0 58	-18	(1 50)	-24	1.8	2.3
Osaka	5.7	202	1 43	+ 15	—	—	2.8	3.5
Kobe	5.8	204	1 29	- 1	2 20	-19	2.9	3.9
Nagasaki	9.8	225	3 15	+ 18	—	—	5.0	—
Zi-ka-wei	16.0	242	e 4 0	- 8	—	—	—	—
Manila	29.1	215	e 7 17	+ 55	—	—	—	—
De Bilt	E. 79.2	333	—	—	—	—	e 46.5	56.4
	N. 79.2	333	—	—	—	—	e 44.5	53.6
Uccle	80.5	333	—	—	—	—	—	45.5
Bidston	80.7	337	—	—	—	—	—	56.5
Strasbourg	81.1	330	—	—	—	—	e 50.5	—
La Paz	147.4	50	e 19 35	[-17]	—	—	—	—

Additional readings: Mizusawa gives also PN = +44s. Osaka MN = +3.4m. Kobe MN = +3.1m.

April 27d. Readings also at 12h. (Tacubaya), 13h. (Athens), 14h. and 16h. (La Paz), 18h. (Athens, Taihoku, Manila, and Zi-ka-wei), 21h. (near Athens).

April 28d. 6h. 38m. 36s. Epicentre $41^{\circ}0'S$. $178^{\circ}5'E$.

$$A = -.754, B = +.020, C = -.656; \quad D = +.026, E = +1.000; \\ G = -.656, H = -.017, K = -.755.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Christchurch		5.0	238	1 18	+ 1	2 18	+ 1	3.4	5.0
Riverview		22.7	280	(e 4 55)	-18	e 4 55	?P	e 7.9	9.7
Sydney		22.7	280	5 54	+41	(9 18)	- 1	9.3	10.4
Melbourne		25.9	266	6 30	+43	(10 24)	- 4	10.4	14.7
Apia		28.5	20	8 24	?	—	—	—	—
Cipolletti		79.7	133	38 30	?L	—	—	(38.5)	46.4
Mendoza		83.8	129	37 48	?L	—	—	39.2	46.3
Pilar	E.	86.9	131	33 6	?	—	—	47.2	50.4
	N.	86.9	131	26 18	?	—	—	—	47.7
La Paz		95.6	118	e 12 53	-54	—	—	54.2	56.4
Kodaikanal		105.0	271	51 18	?L	—	—	(51.3)	—
Chicago		118.4	58	45 24	?	—	—	54.4	—
Ottawa		127.5	59	—	—	—	—	e 58.4	—
Eskdalemuir		165.7	4	—	—	—	—	84.4	—
Bidston		167.6	4	—	—	—	—	—	93.9
De Bilt	E.	168.0	340	—	—	e 39 36	?	e 87.4	92.0
	N.	168.0	340	—	—	e 34 24	?	e 86.4	90.6
Uccle		169.4	340	—	—	—	—	—	85.4
Strasbourg		170.0	323	—	—	—	—	e 91.4	—
Tortosa	N.	178.4	263	—	—	—	—	e 91.4	102.8

Additional readings: Riverview gives also eP = 6h.39m.4s. and 6h.39m.54s., MN = +9.2m., MZ = +9.4m. Ottawa L = +65.4m.

April 28d. 17h. 5m. 0s. Epicentre $37^{\circ}2'N$. $139^{\circ}0'E$. (as on 1922 Jan. 23d.).

$$A = -.601, B = +.522, C = +.605.$$

		Δ	P.	O-C.	S.	O-C.	L.	M.
		°	m. s.	s.	m. s.	s.	m.	m.
Tokyo		1.7	i 0 15	-11	i 0 36	-12	—	0.6
Mizusawa	E.	2.5	0 24	-15	0 50	-19	—	—
	N.	2.5	0 23	-16	0 43	-26	—	—
Nagoya		2.7	0 44	- 2	—	—	1.5	2.0
Osaka		3.9	—	—	1 47	0	2.6	3.7
Kobe		4.0	2 5	?L	—	—	(2.1)	3.7
Zi-ka-wei		15.7	—	—	—	—	e 7.5	—

Additional readings and notes: Tokyo readings have been increased by 1m. Nagoya gives also MN = +2.1m.

April 28d. Readings also at 0h. (near Tokyo and Mizusawa), 3h. (near Tokyo and near Belgrade), 5h. (Ottawa and Chicago), 6h. (Zi-ka-wei, Mizusawa, and Manila), 8h. (Riverview), 9h. (near Tokyo), 10h. (near Athens (2) and Belgrade), 13h. (Strasbourg and Manila), 14h. (Nagasaki), 19h. (near Tokyo, Osaka, and Nagoya), 23h. (Lick and near Tokyo).

April 29d. Readings at 2h. (near Tokyo), 4h. (La Paz and Lick), 8h. (Lick), 9h. (near Mizusawa), 10h. (Lick), 11h. (Melbourne and Riverview), 13h. (Lick), 14h. (Capetown), 16h. (near Tokyo and Nagoya), 17h. (near Mizusawa), 19h. (Lick), 23h. (Batavia).

April 30d. Readings at 7h. (La Paz), 9h. (Nagasaki), 11h. (near Tacubaya), 12h. and 13h. (La Paz), 14h. (De Bilt, Zagreb, Innsbruck, and Rocca di Papa), 15h. (Pompeii and Taihoku), 17h. (Taihoku), 18h. (near Tokyo), 19h. (Hamburg and near Mizusawa), 22h. (Hong Kong, Taihoku, Zi-ka-wei, and near Manila), 23h. (De Bilt, Uccle, Eskdalemuir, and Stonyhurst).

May 1d. 10h. 51m. 10s. Epicentre $32^{\circ}5'N$. $143^{\circ}0'E$. (as on 1921 Sept. 3d.).

$A = -.673$, $B = +.508$, $C = +.537$; $D = +.602$, $E = +.799$;
 $G = -.429$, $H = +.323$, $K = -.843$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	4.1	320	i 0 50	-14	e 1 53	0	e 3.6	12.5
Nagoya	5.7	299	2 43	?S	(2 43)	+ 7	3.1	3.7
Osaka	6.6	291	—	—	3 20	+20	4.5	4.9
Mizusawa E.	6.8	348	1 41	- 3	2 52	-13	—	—
Kobe	6.8	291	—	—	e 3 0	- 5	4.6	5.7
Nagasaki	11.0	275	4 47	?S	(4 47)	- 7	7.2	—
Zi-ka-wei	18.3	272	—	—	—	—	e 8.6	—
Manila	26.8	233	—	—	—	—	e 12.8	—
Christchurch	80.7	159	35 32	?	—	—	39.7	40.7
Hamburg	84.8	334	—	—	—	—	e 38.8	—
Eskdalemuir	87.5	342	—	—	—	—	48.8	—
De Bilt	87.7	335	—	—	—	—	e 46.8	55.5
Uccle	89.0	335	—	—	—	—	—	48.8
Strasbourg	89.6	331	—	—	—	—	50.8	—

Additional readings: Osaka gives also MN = +5.0m. Mizusawa SN = +2m.54s. Kobe MN = +4.7m. De Bilt MN = +55.3m.

May 1d. Readings also at 0h. (Pompeii), 3h. (La Paz), 5h. (near Malaga and Granada), 10h. (near Mizusawa), 11h. (Sydney, Riverview, and near Tacubaya), 12h. (Ottawa, Melbourne, Chicago, Colombo, Ann Arbor, and Washington), 13h. (Eskdalemuir, De Bilt, Uccle, and Strasbourg), 15h. (Riverview), 17h. (near Port au Prince), 20h. (near Tacubaya), 21h. (Manila), 22h. (near Mizusawa and near Tacubaya).

May 2d. 11h. 10m. 45s. Epicentre $20^{\circ}0'N$. $98^{\circ}0'E$.

$A = -.131$, $B = +.931$, $C = +.342$; $D = +.990$, $E = +.139$;
 $G = -.048$, $H = +.339$, $K = -.940$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta	9.4	287	2 10	- 2	4 10	- 3	5.8	9.2
Hong Kong	15.3	78	3 45	+ 2	6 45	+ 6	7.8	8.9
Simla E.	21.8	305	4 57	- 6	8 51	-10	—	—
N.	21.8	305	5 15	+12	9 15	+14	12.8	15.0
Colombo	22.0	236	4 15	-50	8 15	-50	11.8	14.2
Kodaikanal	22.1	247	9 45	?S	(9 45)	+38	18.0	20.6
Taihoku	22.3	73	—	—	e 9 2	- 9	11.9	13.1
Manila	22.6	100	e 5 4	- 8	(8 55)	-22	8.9	9.3
Bombay	23.8	272	9 34	?S	(9 34)	- 6	(14.3)	17.0
Zi-ka-wei	23.8	57	e 5 15	-11	e 9 24	-16	—	13.0
Batavia	27.6	161	e 5 52	-12	i 11 26	+32	(e 14.8)	17.3
Nagasaki	31.1	58	11 24	?S	(11 24)	-29	16.2	17.6
Kobe	35.8	57	e 9 3	?PR ₁	—	—	19.8	22.3
Osaka	36.1	57	12 40	?S	(12 40)	-31	18.1	21.1
Tokyo	39.7	57	—	—	e 18 44	?	e 20.8	21.1
Helwan	60.5	293	—	—	e 18 37	+ 7	—	41.5
Konigsberg N.	66.6	323	—	—	i 19 51	+ 6	e 34.2	37.4
Belgrade	67.4	311	e 9 34	-86	e 20 4	+ 9	39.5	44.0
Vienna	69.8	318	—	—	e 26 15	?	—	41.2
Zagreb	70.2	313	e 11 15	- 3	e 20 15	-13	e 37.2	48.2
Hamburg	72.7	322	—	—	e 22 15	+77	37.6	45.2
Melbourne	72.7	143	—	—	—	—	e 41.2	50.8
Innsbruck N.w.	73.2	318	—	—	—	—	e 34.4	—
Rocca di Papa	73.5	310	—	—	—	—	e 42.0	44.4
Riverview	73.9	137	—	—	—	—	e 35.8	43.1
Strasbourg	75.4	319	e 22 15	?S	(22 15)	+45	e 40.2	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
De Bilt	76.1	321	—	—	21 37	- 1	e 38.2	48.0
Moncalieri	76.2	314	e 19 9	?	26 36	?SR ₁	34.1	48.0
Besançon	76.8	318	—	—	—	—	43.2	—
Uccle	76.9	320	e 16 57	?PR ₁	e 21 46	- 2	e 38.2	43.3
Paris	78.6	319	—	—	—	—	43.2	49.2
Kew	79.5	322	30 15	?L*	—	—	(30.2)	57.2
Eskdalemuir	79.5	326	—	—	e 22 15	- 3	38.2	44.9
Edinburgh	79.6	326	—	—	e 22 15	- 4	—	44.2
Stonyhurst	79.9	324	e 21 39	?S	(e 21 39)	-43	40.4	52.8
Oxford	80.0	322	—	—	22 23	0	31.8	52.4
Bidston	80.4	324	23 10	?S	(23 10)	+42	(34.3)	47.0
Tortosa	N. 82.5	311	—	—	—	—	e 43.2	48.7
Rio Tinto	88.7	310	56 15	?L	—	—	(56.2)	59.2
Coimbra	E. 89.0	312	e 10 44	-146	e 23 44	-19	43.8	51.8
	N. 89.0	312	e 12 28	-42	—	—	e 41.8	52.8
Victoria	102.3	26	—	—	—	—	56.7	62.2
Toronto	116.3	357	—	—	—	—	55.6	—
Chicago	118.0	4	—	—	e 39 45	?SR ₁	64.2	—
La Paz	166.4	283	21 11	[+59]	—	—	—	—

Additional readings and notes: Taihoku gives also MN = +12.4m. Manila MN = +9.9m. Batavia L is given as S, S is given as i. Kobe MN = +19.7m. Osaka MN = +20.0m. Tokyo e = +16m.43s. Helwan e = +14m.8s. Konigsberg ME = +45.0m. Belgrade PR₁ = +15m.38s., SR₁ = +36m.35s., L = +53.6m. Zagreb MNW = -44.2m. Hamburg e = +30m.15s., MN = +41.2m. Melbourne SR₁ = +29m.57s., SR₂ = +33m.27s. Innsbruck eLN = +48.6m., eLNW = +39.6m. Riverview MN = +44.0m. Strasbourg eS = +30m.23s., e = +34m.37s. De Bilt MN = +43.7m. Uccle eS = +26m.39s. Paris e = +24m.3s. and +31m.23s., MN = +44.2m. Victoria and Toronto readings are diminished by one hour. Toronto L = +61.0m.

May 2d. Readings also at 3h. (near Tacubaya), 4h. (Nagoya), 6h. (near Tacubaya), 7h. (Manila), 12h. (Mendoza and Cipolletti), 14h. (Rio Tinto), 20h. (Porto Rico), 21h. (Batavia).

May 3d. 4h. 0m. 20s. Epicentre 51° 2N, 172° 0W.

$$A = -.621, B = -.087, C = +.779; \quad D = -.139, E = +.990; \\ G = -.772, H = -.108, K = -.627.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Honolulu	31.8	155	—	—	—	—	13.7	14.5
Zi-ka-wei	Z. 52.5	275	e 9 16	- 7	e 16 47	- 3	—	—
Chicago	55.6	65	17 20	?S	(17 20)	- 9	31.7	—
Ann Arbor	N. 57.4	61	(11 10)	+75	—	—	11.2	—
Ottawa	59.2	54	10 10	+ 4	18 19	+ 6	e 29.0	—
Eskdalemuir	73.1	7	—	—	e 21 10	+ 7	35.7	47.2
Bidston	75.1	7	—	—	—	—	—	57.9
De Bilt	E. 76.9	1	—	—	e 21 46	- 2	e 41.7	53.5
	N. 76.9	1	—	—	—	—	e 49.7	54.1
Uccle	78.1	2	e 21 58	?S	(21 58)	- 3	(e 32.1)	—
Strasbourg	80.3	0	—	—	—	—	e 50.7	—
Zagreb	82.8	355	—	—	—	—	41.7	—
Coimbra	87.6	12	e 11 40	-83	23 32	-16	e 60.2	—

Additional readings: Chicago gives also L = +33.7m. Ottawa L = +31.7m., T₀ = 4h.0m.23s. Coimbra eLN = +49.2m.

May 3d. Readings also at 5h. (Cipolletti, Mendoza, and near Port au Prince), 9h. (near Tokyo), 12h. (Nagasaki), 15h. (Zi-ka-wei), 16h. (Batavia, Colombo, Sydney, Riverview, Melbourne, Adelaide, and Zi-ka-wei), 22h. (near Mizusawa).

1922. May 4d. 9h. 12m. 45s. Epicentre 46°0N. 154°0E.

A = -·624, B = +·305, C = +·719; D = +·438, E = +·899;

G = -·647, H = +·315, K = -·695.

The epicentre 45°3N. 153°5E. of April 26d. was tried but found unsuitable.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	"	m. s.	s.	m. s.	s.	m.	m.
Ootomari	7·8	271	2 3	+ 5	(3 34)	+ 3	3·6	4·3
Tokyo	14·9	231	e 3 38	0	e 6 25	- 5	e 10·6	12·6
Nagoya	16·8	236	4 0	- 2	—	—	—	—
Osaka	18·0	238	2 38	?	(7 0)	-40	7·0	9·8
Kobe	18·2	238	i 4 19	0	7 48	+ 4	9·9	18·8
Nagasaki	22·7	243	5 10	- 3	9 12	- 7	12·4	—
Zi-ka-wei	29·1	251	i 6 6	-13	e 10 58	-21	e 13·6	17·9
Taihoku	33·3	242	—	—	e 12 47	+18	—	—
Hong Kong	39·4	246	7 41	- 9	—	—	—	—
Manila	41·8	232	e 7 59	-10	—	—	—	—
Honolulu	46·0	104	8 35	- 5	15 23	- 5	—	25·5
Victoria	53·4	55	—	—	(15 45)	-76	15·8	30·1
Calcutta	57·3	270	9 48	- 6	—	—	—	—
Simla	N. 59·5	285	18 9	—	(18 9)	- 8	e 34·6	—
Berkeley	59·9	66	e 10 31	+20	e 18 33	+11	e 25·7	27·4
Lick	N. 60·7	66	—	—	—	—	e 26·7	—
Batavia	66·9	232	i 11 0	+ 3	i 19 50	+ 1	—	—
Upsala	68·3	339	11 7	+ 1	e 20 3	- 3	e 33·2	36·9
Bombay	70·4	277	20 30	—	(20 30)	- 1	(e 36·9)	—
Konigsberg	E. 71·8	334	11 30	+ 2	20 13	-35	e 38·2	45·2
	N. 71·8	334	11 35	+ 7	20 48	0	—	—
Titlis	72·1	313	e 13 39	?PR ₁	—	—	37·2	48·2
Kodaikanal	73·3	269	21 21	—	(21 21)	+15	—	—
Colombo	74·0	265	10 15	-87	22 15	+61	49·8	57·2
Lemberg	74·8	329	e 10 15	-93	e 21 3	-21	e 37·4	50·4
Hamburg	75·8	340	i 11 54	0	e 21 35	0	e 36·2	43·6
Edinburgh	76·3	348	45 15	—	—	—	(45·2)	—
Chicago	76·5	43	11 56	- 2	i 21 42	- 1	e 36·2	—
Eskdalemuir	E. 76·9	348	i 12 1	+ 1	i 21 47	- 1	33·2	44·0
	N. 76·9	348	—	—	—	—	36·2	49·7
Ann Arbor	N. 77·9	40	12 9	+ 3	22 9	+10	37·0	—
Stonyhurst	78·1	347	e 27 45	?SR ₁	—	—	—	54·2
De Bilt	E. 78·3	341	12 11	+ 2	22 7	+ 3	e 35·2	45·6
	N. 78·3	341	—	—	—	—	e 38·2	55·6
Budapest	78·5	331	e 13 17	+67	e 22 5	- 1	e 41·6	—
Toronto	78·6	37	e 18 3	?PR ₁	21 45	-22	e 46·8	55·6
Bidston	78·7	347	13 10	+59	21 0	-68	—	58·0
Ottawa	78·7	33	12 10	- 1	22 4	- 4	e 32·2	—
Vienna	78·8	333	i 12 10	- 2	22 44	+34	e 44·2	52·8
Uccle	79·7	341	e 12 11	- 6	e 22 16	- 4	e 36·2	44·2
Riverview	79·9	183	e 12 23	+ 5	e 22 20	- 2	e 34·4	43·4
Oxford	80·0	346	—	—	22 17	- 6	—	—
Kew	80·1	346	22 15	—	(22 15)	- 9	—	60·2
Belgrade	80·4	329	e 12 17	- 4	e 22 44	+16	e 42·8	55·1
Ithaca	80·8	36	—	—	—	—	45·2	—
Strasbourg	E. 81·0	339	e 12 27	+ 2	e 22 30	- 5	37·8	42·7
	N. 81·0	339	e 12 37	+12	e 22 32	- 3	—	53·2
Zagreb	81·0	331	e 12 25	0	e 22 33	- 2	38·2	51·4
Zurich	Z. 81·8	338	e 12 25	- 4	—	—	—	—
Paris	82·0	312	e 12 28	- 2	e 22 40	- 6	42·2	45·2
Adelaide	82·1	194	—	—	i 22 45	- 2	e 46·2	65·8
Besançon	82·7	339	e 12 32	- 2	—	—	42·2	—
Padova	82·7	335	11 57	-37	22 15	-39	44·2	54·8
Georgetown	E. 83·5	38	e 12 45	+ 6	23 0	- 3	49·2	—
	N. 83·5	38	e 12 40	+ 1	—	—	54·2	—
Washington	83·5	38	13 15	- 36	23 15	+12	e 43·2	—
Melbourne	84·1	187	—	—	23 15	+ 6	42·6	61·2
Moncalieri	84·3	337	12 40	- 4	22 26	-45	41·1	63·6
Puy de Dôme	84·8	341	12 15	-32	—	—	—	—
Rocca di Papa	85·7	332	i 12 45	- 7	e 23 9	-18	47·8	57·8
Helwan	88·1	313	i 12 58	- 8	23 22	-31	55·2	57·9
Barcelona	89·0	339	—	—	23 51	-12	46·1	55·2

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tortosa	N. 90.0	341	—	—	—	—	e 44.2	61.6
Coimbra	92.4	347	e 13 15	-14	23 53	-46	e 42.8	60.0
Algiers	93.2	337	—	—	e 23 48	-59	e 49.2	57.2
Rio Tinto	94.4	345	19 15	?L	—	—	(49.2)	55.2
Granada	94.5	342	e 13 39	-2	e 24 53	-8	e 35.2	—
San Fernando	95.6	344	17 33	?PR ₁	—	—	—	60.2
La Paz	134.3	63	e 19 36	[-7]	—	—	73.2	82.2

Additional readings and notes : Ootomari gives also MN = +4.0m. Osaka
 MN = -11.1m. Zi-ka-wei MZ = -18.8m., MN = -19.7m. All readings
 given as at 3h. Honolulu PR₁ = 10m.38s., SR₁N = 18m.45s., SR₂E =
 +19m.50s., SR₂N = +20m.20s., MN = +22.2m. Victoria readings have
 been diminished by 1h. Simla SN = +30m.45s. Batavia i =
 -13m.38s. Apia (L 67.3) gives simply 10h. Upsala MN
 +47.2m. Konigsberg iPZ = +11m.28s. (O-C=0s.). Hamburg
 MZ = +46.6m., MN = +50.2m. Eskdalemuir PR₁? = +14m.55s., SR₁? =
 +27m.0s., T = 9h.12m.58s. Stonyhurst P has been increased by 1h.
 De Bilt SR₁ = +27m.35s. Toronto eL = +51.6m. Ottawa L =
 43.2m., T₀ = 9h.12m.59s. Belgrade PR₁ = +14m.3s., SR₁ = +26m.11s.,
 SR₂ = +40m.2s. Uccle SR₁ = +27m.57s., MN = +55.7m. Riverview
 MN = +41.8m., T₀ = 9h.12m.56s. Strasbourg PV = +12m.20s. (O-C =
 -5s.). Zagreb MNW = +46.2m. Paris MN = +56.2m. Adelaide
 e = +30m.15s. Padova PR₁ = +13m.30s. Melbourne SR₁ = +34m.45s.(?).
 Moncalieri MN = +60.0m. Barcelona e = +22m.41s. Coimbra MN =
 +57.7m., T₀ = 9h.13m.19s. Granada i = +16m.3s. and +26m.21s. San
 Fernando MN = +64.0m. La Paz PR₁ = +23m.14s.

May 4d. 21h. 26m. 15s. Epicentre 36°1N. 137°3E. (as on 1921 Sept. 17d.).

A = -594, B = -548, C = -589.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Nagoya	1.0	196	0 10	-5	—	—	—	—
Tokyo	2.0	100	0 34	+3	0 59	-4	1.4	—
Osaka	2.1	218	0 30	-3	—	—	—	3.7
Kobe	2.2	231	1 0 20	-14	—	—	1.3	3.1
Zi-ka-wei	14.1	254	e 2 36	-51	—	—	—	—
La Paz	150.1	56	18 48	[-68]	—	—	—	—

No additional readings. Kobe gives the above as on May 6d.

May 4d. Readings also at 0h. and 2h. (Batavia), 8h. (Granada), 9h. (Vienna),
 10h. (Mendoza and Pilar), 11h. (Port au Prince), 12h. (La Paz), 13h.
 (Florence), 20h. (near Port au Prince).

May 5d. 0h. 18m. 30s. Epicentre 44°0N. 152°0E.

A = -635, B = +338, C = +695; D = +469, E = +883;
 G = -613, H = +326, K = -719.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ootomari	7.0	295	1 53	+7	(3 11)	+1	3.2	4.5
Mizusawa	E. 9.5	243	2 28	+5	4 12	-4	—	—
Tokyo	12.5	232	e 5 19	?S	(e 5 19)	-13	e 7.1	—
Osaka	15.8	239	4 8	+19	—	—	—	9.9
Kobe	16.0	240	3 55	+3	8 15	?L	12.1	15.0
Zi-ka-wei	27.2	252	e 5 49	-11	e 10 39	-6	—	17.6
Taihoku	31.1	241	—	—	—	—	e 18.6	—
Manila	39.5	230	e 8 30	+39	—	—	—	—
Tiflis	72.3	312	—	—	—	—	e 41.5	—
Hamburg	77.2	338	e 11 54	-8	—	—	e 40.5	—
Chicago	79.0	41	—	—	e 34 45	?	e 42.8	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Stonyhurst		79.7	346	—	—	—	—	—	69.5
De Bilt	E.	79.8	340	—	—	—	e 42.5	44.2	—
	N.	79.8	340	—	—	—	e 44.5	54.1	—
Vienna		79.9	332	i 12 8	-10	(22 0)	-22	—	51.0
Ann Arbor	E.	80.3	38	—	—	—	—	46.9	—
Ottawa		81.1	31	—	—	—	e 40.0	—	—
Uccle		81.1	340	e 14 49	?	—	—	e 37.5	—
Belgrade		81.3	327	e 39 50	?L	e 50 20	?	75.8	—
Kew		81.6	345	—	—	—	—	—	61.5
Zagreb		82.1	330	e 12 30	-1	—	—	31.5	52.5
Strasbourg		82.3	338	—	—	—	e 39.5	49.5	—
Paris		83.4	340	—	—	—	e 47.5	—	—
Moncalieri		85.5	336	—	—	e 24 18	+53	48.9	—
Rocca di Papa		86.8	330	e 13 6	+8	—	—	e 41.8	53.3
Coimbra		94.0	346	—	—	e 43 50	?L	e 53.8	—
Algiers		94.5	335	—	—	—	—	e 36.5	38.0
La Paz		136.4	64	—	—	—	—	96.4	97.6

Additional readings: Mizusawa gives also SN = +4m.10s. Tokyo eS = +6m.18s. Kobe MN = +12.3m. Stonyhurst P = 0h.13m.30s.
 Vienna iPR₁ = +14m.45s., S is recorded as PSE. Ann Arbor LN = +48.0m. Ottawa L = +47.5m. Zagreb e = +14m.54s., MNW = +47.5m. Algiers readings diminished by 1h.

May 5d. Readings also at 0h. (Zi-ka-wei, near Mizusawa, and near La Paz), 1h. (Kobe, near Mizusawa, Moncalieri, Manila, La Paz, Uccle, and De Bilt), 2h. (Zi-ka-wei), 6h. (La Paz), 8h. (Taihoku, Tacubaya, and Vera Cruz), 14h. (Batavia, Zi-ka-wei, Riverview, and Manila), 15h. (La Paz), 18h. (Strasbourg), 20h. (Taihoku), 21h. (2) and 22h. (Manila).

May 6d. 12h. 20m. 0s. Epicentre 47° 3'N. 151° 5'E. (as on 1921 Sept. 5d.).

A = -596, B = +324, C = +735; D = +477, E = +879;
 G = -646, H = +351, K = -678.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari		6.0	267	1 40	+8	—	—	3.2	4.2
Mizusawa	E.	11.1	226	2 36	-10	4 29	-28	—	—
	N.	11.1	226	2 42	-4	4 31	-26	—	—
Tokyo		14.5	221	6 31	?S	(6 31)	+11	e 8.0	—
Kobe		17.6	230	e 3 58	-14	—	—	e 10.9	—
Zi-ka-wei		28.0	246	e 5 58	-10	e 10 56	-3	—	16.0
Manila		41.4	229	e 8 26	+20	—	—	—	—
Konigsberg		69.8	332	i 11 13	-3	—	—	e 41.1	46.4
Tiflis		69.9	310	—	—	—	—	e 42.0	—
Colombo		72.5	263	46 0	?L	—	—	(46.0)	58.0
Hamburg		74.0	338	—	—	—	—	e 38.0	46.8
Eskdalemuir		75.2	347	—	—	e 21 0	-28	40.0	—
De Bilt	E.	76.5	340	—	—	21 46	+3	e 36.0	45.2
	N.	76.5	340	—	—	—	—	e 41.0	52.5
Bidston		77.0	345	—	—	—	—	—	55.0
Uccle		77.9	340	e 12 6	0	e 22 0	+1	e 35.0	—
Oxford		78.3	345	—	—	—	—	—	55.0
Kew		78.3	345	—	—	—	—	—	63.0
Zagreb		79.0	330	e 12 6	-7	e 22 0	-12	e 40.0	53.9
Strasbourg	E.	79.4	337	—	—	—	—	e 42.0	—
Paris		80.2	341	e 22 25	?S	(e 22 25)	0	47.0	57.0
Rocca di Papa		83.8	330	e 34 24	?	—	—	—	36.8
Algiers		91.3	335	20 0	?PR ₁	—	—	—	—

Additional readings and notes: Ootomari gives its readings as at 13h. Tokyo S = +7m.9s. Zagreb MNW = +45.4m. Rocca di Papa E = +35m.0s., N = -35m.6s.

May 6d. Readings also at 2h. (Zi-ka-wei, Kodaikanal, and near Mizusawa), 3h. (De Bilt, Batavia, Uccle, Strasbourg), 4h. (Simla (3) and Zagreb), 6h. (near Belgrade), 10h. (near Tokyo and Mizusawa), 16h. (Zi-ka-wei, Manila, and near Hong Kong), 20h. (Riverview and near Tokyo), 21h. (Manila and Riverview), 23h. (Zagreb, De Bilt, and near Athens).

May 7d. Readings at 3h. (Manila), 4h. (near Vera Cruz, Oaxaca, Tacubaya, and near Athens), 6h. (near La Paz), 9h. (Manila), 10h. (Zi-ka-wei), 13h. (La Paz), 14h. (near Tokyo), 16h. (Batavia), 19h. (Zi-ka-wei and near Mizusawa and Tokyo), 22h. (Nagoya).

May 8d. Readings at 2h. (Batavia), 12h. (Zagreb, Rocca di Papa, and Pompeii), 15h. (Batavia), 16h. (Zi-ka-wei and near Tokyo), 20h. (Zi-ka-wei), 21h. (Colombo).

May 9d. 3h. 28m. 48s. Epicentre $36^{\circ}5'N$. $139^{\circ}5'E$.

$$A = -.611, B = +.522, C = +.595.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	0.9	i 0 15	+ 1	i 0 23	- 2	—	0.4
Nagoya	2.5	0 42	+ 3	—	—	1.4	2.0
Mizusawa	2.9	0 51	+ 6	1 27	+ 7	—	—
Osaka	3.8	1 11	+ 12	—	—	2.1	2.7
Kobe	4.0	i 0 59	- 3	1 38	- 12	2.2	2.4
Zi-ka-wei	Z. 15.9	3 42	- 9	e 6 46	- 7	—	10.6
De Bilt	E. 82.8	—	—	—	—	e 47.2	—
La Paz	148.4	19 52	[- 1]	—	—	—	—

Additional readings : Nagoya gives also MN = + 1.4m. Osaka MN = + 2.8m.
De Bilt eLN = + 45.2m.

May 9d. 7h. 25m. 10s. Epicentre $34^{\circ}5'N$. $1^{\circ}5'W$.

$$A = +.824, B = -.022, C = +.566; \quad D = -.026, E = -1.000; \\ G = -.566, H = -.015, K = -.824.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Almeria	2.5	342	0 57	+18	—	—	—	—
Granada	3.2	328	0 49	- 1	i 1 27	- 1	i 1.6	2.3
Malaga	3.3	315	0 24	-28	—	—	—	—
San Fernando	4.3	299	1 39	+32	—	—	—	2.5
Algiers	4.4	57	e 2 30	?L	3 14	?	(2.5)	4.3
Tortosa	N. 6.5	14	e 1 43	+ 4	—	—	—	—
Barcelona	7.5	22	e 1 54	0	—	—	—	5.8
Uccle	16.9	13	—	—	—	—	e 8.8	—
De Bilt	E. 18.2	13	—	—	—	—	e 9.8	—

Additional readings : Granada i = + 1m.4s., MN = + 2.2m. De Bilt eN = + 10m.50s.

May 9d. 13h. 50m. 15s. Epicentre $8^{\circ}1'S$. $119^{\circ}6'E$.

$$A = -.489, B = +.861, C = -.141; \quad D = +.869, E = +.494; \\ G = +.070, H = -.123, K = -.990.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Batavia	12.8	278	3 9	- 1	e 5 18	-21	—	7.6
Manila	22.7	3	5 26	+13	(8 52)	-27	8.9	10.8
Perth	24.1	188	—	—	(10 10)	+24	10.2	—
Hong Kong	30.9	352	7 45	+68	—	—	—	—
Taihoku	33.2	4	e 6 59	+ 1	—	—	—	—
Melbourne	37.5	146	7 33	- 1	13 33	+ 2	19.5	21.5
Riverview	38.9	138	e 7 35	-10	e 13 32	-19	e 19.5	23.8
Sydney	38.9	138	15 9	?S	(15 9)	+78	—	22.7
Zi-ka-wei	39.3	4	7 48	- 1	e 13 56	0	—	22.9
Calcutta	43.3	317	8 32	+12	—	—	—	—
Kodaikanal	45.8	293	15 39	?S	(15 39)	+14	—	—
Simla	E. 56.5	317	11 51	?PR ₁	18 15	+35	19.3	—
Tiflis	84.3	315	e 13 45	+61	(22 45)	-26	—	22.8
Helwan	92.5	300	13 22	- 8	23 45	-55	—	24.3

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Capetown	94.6	235	24 1	?S	(24 1)	-61	—	—
Belgrade	98.5	315	e 24 34	?	(e 25 46)	+ 5	—	29.2
Zagreb	105.2	316	e 18 45	?PR ₁	i 24 51	-113	45.8	—
Rocca di Papa	108.0	311	e 16 21	-93	i 25 3	-127	—	25.1
Strasbourg	110.5	319	e 19 18	?PR ₁	e 29 37	+124	e 35.8	—
De Bilt	111.3	323	e 20 3	?PR ₁	i 26 19	-141	e 54.8	67.4
Uccle	112.1	322	e 19 33	?PR ₁	e 28 44	+57	e 52.8	69.8
Paris	113.7	320	—	—	e 25 29	-151	—	—
Victoria	113.9	40	—	—	—	—	55.8	61.8
Kew	114.7	324	—	—	—	—	—	30.8
Eskdalemuir	114.9	328	e 19 58	?PR ₁	29 45	+96	51.8	—
Oxford	115.1	324	—	—	i 25 34	-157	—	30.3
Bidston	115.6	326	—	—	—	—	—	64.2
Algiers	116.0	307	e 19 43	?PR ₁	e 29 45	+87	e 47.8	52.2
Tortosa	117.1	312	—	—	—	—	e 54.8	—
Toronto	140.8	22	(17 39)	?	—	—	17.4	—
La Paz	154.2	163	20 12 [+11]	—	30 53	?	49.6	—

Additional readings and notes: Batavia suggests $T_0 = 13h.50m.28s.$ Epicentre $6^\circ 5'S. 118^\circ 7'E.$, which was first tried. Manila MN = +11.4m. Perth gives also $SR_1 = +3m.7s.$ Riverview PS? = +14m.6s., $eSR_1? = +16m.14s.$ MN = +24.1m., MZ = +27.2m. Sydney P has been increased by 30m. Rocca di Papa iPN = +19m.19s. (?PR₁N). De Bilt MN = +59.4m. Uccle e = +25m.21s. Eskdalemuir iE = +25m.31s. and +26m.44s. Algiers iPR₁ = +25m.33s.

May 9d. Readings also at 3h. (near Athens), 6h. (near Tacubaya and near Vera Cruz), 7h. (near Vera Cruz), 9h. (Manila), 10h. (Zi-ka-wei), 13h. (La Paz, Melbourne, Adelaide, Manila, Riverview, and Zi-ka-wei), 14h. (Victoria and Adelaide), 19h. (Zi-ka-wei, Manila, and near Athens).

May 10d. 9h. 20m. 6s. Epicentre $6^\circ 0'S. 113^\circ 0'E.$

A = -389, B = +915, C = -105; D = +921, E = +391;
G = +041, H = -096, K = -995.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Batavia	6.2	267	i 1 50	+15	i 2 36	-13	—	4.7
Manila	22.1	21	e 5 14	+ 8	(9 20)	+13	9.3	10.9
Hong Kong	28.4	2	—	—	10 57	- 9	—	13.1
Zi-ka-wei	38.1	13	7 31	- 8	e 13 25	-14	—	17.0
Melbourne	43.0	143	e 10 18	?PR ₁	—	—	—	29.9
Riverview	44.9	136	e 10 2	+90	e 17 33	+139	26.0	30.7
Zagreb	99.2	316	—	—	e 24 9	-99	—	—
De Bilt	E. 105.7	323	—	—	e 24 40	-129	e 56.9	—
Berkeley	E. 120.7	49	—	—	—	—	e 48.9	—
La Paz	157.4	177	e 19 52	(-13)	—	—	—	—

Additional readings: Manila MN = +11.4m. Zi-ka-wei $SR_1Z = +14m.31s.$
Riverview MN = +27.1m., $T_0 = 9h.20m.41s.$ De Bilt $eLN = +54.9m.$

May 10d. 16h. 31m. 54s. Epicentre $29^\circ 0'N. 139^\circ 0'E.$ (as on 1921 Mar. 4d.).

A = -660, B = +574, C = +485; D = +656, E = +755;
G = -366, H = +318, K = -875.

The residuals would be somewhat improved by diminishing T_0 by 16 sec., and putting the epicentre 1.2 further East (at $29^\circ 0'N. 140^\circ 2'E.$), but there are advantages in retaining the former epicentre for comparison.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Osaka	6.4	333	1 53	+15	—	—	3.7	4.6
Kobe	6.5	332	—	—	—	—	—	3.8
Tokyo	6.7	5	i 1 24	-18	i 1 33	-89	—	1.6
Mizusawa	E. 10.3	9	2 31	- 3	4 45	+ 8	—	—
Zi-ka-wei	15.3	283	e 3 18	-25	—	—	—	—
Manila	22.0	233	e 5 6	+ 1	—	—	—	—

Mizusawa gives also PN = +2m.30s.

May 10d. Readings also at 2h. (Colombo), 11h. (Alicante and near Tokyo), 16h. (near Tokyo), 18h. (Taihoku), 23h. (Georgetown).

May 11d. 0h. 44m. 32s. Epicentre $48^{\circ}8'S. 79^{\circ}0'W.$

A = +126, B = -647, C = -752; D = -982, E = -191;
G = -144, H = +739, K = -659.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Cipolletti		12.5	42	3 34	+28	—	—	4.4	7.4
Mendoza		17.8	31	6 58	?8	(6 58)	-38	8.7	11.5
Pilar	E.	20.5	39	4 58	+11	(8 28)	-6	8.5	11.2
	N.	20.5	39	4 52	+5	(8 28)	-6	8.5	12.0
Chacarita	E.	20.8	55	4 52	+1	—	—	10.4	12.5
	N.	20.8	55	5 34	+43	—	—	11.4	13.1
La Paz		33.5	19	i 6 55	-6	i 12 24	-8	18.3	21.5
Riverview		86.1	220	—	—	e 37 22	? e 43.1	50.4	—
Georgetown		87.7	2	—	—	e 23 50	+1	—	—
Chicago		90.8	354	16 3	?	23 28	-54	43.5	—
Toronto		92.4	0	—	—	—	—	e 34.4	—
Ottawa		94.2	3	—	—	i 24 17	-41	41.5	—
Rio Tinto		107.6	52	77 28	?L	—	—	(77.5)	80.5
Coimbra		108.5	48	e 19 58	?PR ₁	28 38	+83	e 47.5	—
Tortosa	N.	113.6	53	—	—	—	—	e 60.5	74.0
Oxford		120.2	44	—	—	—	—	55.5	67.1
Kew		120.5	44	—	—	—	—	—	74.5
Bidston		120.6	42	—	—	—	—	—	67.5
Stonyhurst		121.1	42	27 58	?8	(27 58)	-60	—	73.0
Eskdalemuir		121.8	40	—	—	30 28	+85	53.5	—
Edinburgh		122.1	40	63 28	?L	—	—	(63.5)	—
Uccle		122.3	47	—	—	e 30 40	+94	e 56.5	68.5
Strasbourg		122.6	51	—	—	e 30 28	+79	—	72.5
De Bilt		123.5	47	—	—	e 30 52	+96	e 58.5	73.1
Zi-ka-wei		156.6	229	e 20 30	[+26]	—	—	—	—

Additional readings: Riverview gives also MN = +52.3m.
eN = 1h.9m. De Bilt MN = +74.1m.

Georgetown

May 11d. 6h. 45m. 25s. Epicentre $11^{\circ}8'N. 60^{\circ}5'W.$

A = +482, B = -852, C = +204; D = -870, E = -492;
G = +101, H = -178, K = -979.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Porto Rico	E.	8.0	324	2 13	+12	4 9	+32	5.5	12.5
	N.	8.0	324	—	—	3 49	+12	4.8	—
Port au Prince		13.3	302	i 3 45	+28	—	—	6.3	6.8
La Paz		29.3	195	i 6 7	-14	i 10 53	-29	14.0	17.2
Georgetown	E.	30.9	335	e 6 35	-2	11 50	0 e 18.9	—	—
Washington		30.9	335	7 15	+38	12 26	+36	15.6	—
Ithaca	N.	33.7	340	e 6 59	-3	e 12 41	+5 e 18.2	—	—
Ottawa		36.0	343	7 18	-4	13 5	-5	19.6	—
Ann Arbor	N.	36.6	331	6 47	-40	13 11	-7	25.4	—
Chicago		38.2	326	7 30	-10	13 40	-1	18.8	—
Rio de Janeiro		38.6	155	—	—	e 16 3	?SR ₁	17.9	—
Pilar	E.	43.6	184	14 5	?8	(14 5)	-51	17.3	25.4
Mendoza		45.3	189	14 35	?8	(14 35)	-44	18.7	30.2
Chacarita	E.	46.4	178	15 5	?8	(15 5)	-28	18.6	24.7
Cipolletti		51.2	188	16 17	?8	(16 17)	-17	20.4	29.2
Coimbra	E.	53.8	49	9 32	0	17 1	-5	23.8	25.6
	N.	53.8	49	—	—	—	—	20.6	23.8
Tortosa	N.	60.5	50	10 20	4	18 27	-3	25.0	25.3
Bidston		61.4	36	—	—	19 35	+54	—	29.6
Algiers		61.9	55	e 10 25	+1	e 18 47	0	25.6	34.6
Oxford		62.0	38	i 10 29	+4	i 18 47	-1	—	—
Stonyhurst		62.0	36	9 17	-68	—	—	34.6	—
Eskdalemuir	E.	62.0	34	10 30	+5	18 48	0	28.6	34.8
	N.	62.0	34	—	—	18 52	+4	—	34.7
Edinburgh		62.3	34	e 8 23	-124	18 55	+3	30.6	35.2
Kew		62.4	38	—	—	—	—	—	28.6

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Victoria	63.3	319	—	—	(18 41)	-24	18.7	—
Paris	63.5	41	—	—	i 19 9	+ 2	26.6	32.6
Uccle	65.1	39	e 10 47	+ 1	e 19 27	+ 1	e 28.6	—
De Bilt	E. 65.9	39	11 1	+11	19 38	+ 2	e 30.6	37.6
	N. 65.9	39	—	—	—	—	e 28.6	36.5
Strasbourg	66.9	42	e 11 5	+ 8	e 20 20	+31	—	—
Hamburg	69.0	38	e 11 13	+ 2	e 20 16	+ 2	e 31.6	38.6
Rocca di Papa	69.7	50	11 13	- 2	—	—	—	12.1
Pompeii	71.1	51	e 11 15	- 9	—	—	—	—
Zagreb	72.2	46	e 11 29	- 2	20 53	+ 1	e 32.6	40.6
Vienna	72.6	43	11 34	0	c 20 54	- 3	e 36.6	48.6
Belgrade	75.4	46	e 10 52	-59	e 16 5	?PR ₁	—	—
Zi-ka-wei	Z. 137.0	358	e 22 38	?PR ₁	—	—	—	—

Additional readings: Port au Prince gives also MNW = +6.4m. La Paz
 iSN = +10m.56s., T₀ = 6h.45m.28s. Georgetown SN? = +11m.45s.
 Ottawa PR₂? = +8m.39s., SR₂ = +15m.46s., T₀ = 6h.45m.15s. Paris
 iSE = +19m.4s. Hamburg SR₁ = +28m.35s., MN = +37.6m. Rocca
 di Papa ePN = +11m.11s. Zagreb MNW = +41.6m. Belgrade e =
 +10m.55s., +12m.48s., and +15m.25s.

May 11d. 9h. 14m. 55s. Epicentre 22°-08. 170°-0E. (as on 1919 Sept. 1d.).

A = -0.913, B = +0.161, C = -0.375; D = +0.174, E = +0.985;
 G = +0.369, H = -0.065, K = -0.927.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	19.2	68	4 21	-10	6 23	-103	7.8	16.1
Riverview	20.4	230	i 4 46	0	c 8 30	- 2	e 9.4	11.3
Sydney	20.4	230	4 41	- 5	(8 35)	+ 3	8.6	11.8
Christchurch	21.6	175	9 5	?S	(9 5)	+ 8	10.6	17.6
Melbourne	26.7	228	5 59?	+ 4	10 35	0	13.3	18.9
Adelaide	30.3	238	—	—	i 11 17	-22	—	20.0
Perth	48.8	245	—	—	26 45	?L	31.5	31.9
Honolulu	E. 53.5	38	—	—	17 22	+19	22.1	37.3
	N. 53.5	38	—	—	15 41	-82	22.7	35.8
Manila	60.4	303	e 10 32	+17	—	—	—	—
Batavia	62.8	274	10 35	+ 4	—	—	30.6	34.8
Zi-ka-wei	70.7	319	11 32	+11	e 20 24	-10	—	37.4
Victoria	92.1	38	—	—	—	—	—	46.7
Kodaikanal	96.2	279	35 5	?	—	—	48.1	51.2
Cipolletti	98.3	138	59 11	?L	—	—	(59.2)	62.3
Mendoza	101.8	133	32 23	?SR ₁	—	—	52.0	59.8
Pilar	105.6	134	31 35	?SR ₁	—	—	—	75.6
Chicago	113.5	51	—	—	c 26 5	-113	50.1	—
Toronto	119.7	51	—	—	—	—	66.1	74.0
Ottawa	122.3	49	—	—	c 33 53	?	60.1	—
Hamburg	145.0	340	e 19 43	[- 5]	—	—	e 64.1	89.1
Edinburgh	145.7	353	—	—	—	—	—	125.1
Belgrade	146.2	320	e 19 51	[+ 1]	i 32 47	?	41.0	—
Eskdalemuir	146.4	353	e 19 55	[+ 5]	e 31 34	?	65.1	—
Vienna	146.4	329	i 19 49	[+ 1]	—	—	e 68.1	79.1
De Bilt	E. 147.7	343	—	—	—	—	e 64.1	83.5
	N. 147.7	343	19 58	[+ 6]	—	—	e 75.1	80.7
Bidston	148.2	350	—	—	—	—	—	103.1
Zagreb	148.2	326	e 19 54	[+ 1]	—	—	e 63.1	78.1
Uccle	149.1	343	e 19 55	[+ 1]	e 33 17	?	61.1	—
Oxford	149.5	349	25 2	?PR ₁	—	—	75.1	108.6
Kew	149.6	350	—	—	—	—	—	124.1
Strasbourg	149.9	333	c 20 0	[- 4]	—	—	e 66.1	—
Paris	151.5	343	—	—	—	—	e 81.1	91.1
Pompeii	152.1	318	e 20 5	[+ 6]	—	—	—	—
Rocca di Papa	152.6	321	20 11	[+11]	—	—	—	20.6
Algiers	161.4	326	—	—	—	—	e 53.1	110.1
Coimbra	161.8	356	e 23 15	?	25 15	?PR ₁	e 58.1	—

Additional readings: Apia gives MN = +8.1m. Riverview i = +4m.50s.
 ePR₂ = +5m.25s., MN = +12.1m., MZ = +18.6m., T₀ = 9h.15m.0s. Christ-
 church gives a reading at +5m.59s.? Melbourne PR₁ = +6m.41s., SR₁ =
 +12m.5s. Perth PR₁ = +24m.35s., SR₁ = +29m.20s. Batavia i =
 +19m.6s., +19m.57s., and +20m.49s., MN = +35.8m. Toronto eL =
 +72.0m. Ottawa e? = +36m.23s., eL = +52.1m. Hamburg MN =
 +85.1m.

May 11d. Readings also at 12h. (near Mizusawa), 14h. and 15h. (La Paz).

1922. May 12d. 18h. 39m. 20s. Epicentre 22°-0S. 170°-0E.
(as on 11d.).

A = -·913, B = -·161, C = -·375; D = +·174, E = +·985;
G = +·369, H = -·065, K = -·927.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°		m. s.	s.	m. s.	s.	m.	m.
Apia	19·2	68	4 35	+ 4	8 4	- 2	—	17·7
Riverview	20·4	230	i 4 50	+ 4	i 8 42	+10	e 9·9	10·9
Sydney	20·4	230	4 46	0	8 40	+ 8	10·3	12·7
Christchurch	21·6	175	—	—	10 4	+67	11·2	14·0
Melbourne	26·7	228	6 4	+ 9	10 46	+11	13·4	16·7
Adelaide	30·3	238	6 40?	+ 9	i 11 25	-14	e 14·4	19·4
Perth	48·8	245	—	—	15 23	-41	27·2	30·8
Honolulu	N. 53·5	38	i 9 34	+ 4	i 17 17	+14	e 25·3	28·0
Manila	60·4	303	e 10 5	-10	—	—	—	—
Batavia	62·8	274	i 10 32	- 1	i 19 6	+ 8	23·8	36·3
Nagasaki	66·9	324	19 48	?S	(19 48)	- 1	—	—
Hong Kong	70·2	307	11 19	+ 1	—	—	—	—
Zi-ka-wei	70·7	319	i 11 26	+ 5	e 20 36	+ 2	—	37·6
Berkeley	87·3	16	i 12 55	- 6	e 23 40	- 4	e 40·9	—
Lick	N. 87·5	47	—	—	—	—	i 44·2	—
Victoria	92·1	38	—	—	23 32	-64	29·8	48·8
Colombo	92·8	276	—	—	47 40	?L	56·7	59·2
Tucson	E. 93·0	55	—	—	—	—	43·7	50·9
Kodaikanal	96·2	279	24 10	?S	(24 10)	-68	54·3	64·1
Cipolletti	98·3	138	30 34	?SR ₁	—	—	58·7	64·7
Mendoza	101·8	133	18 10	?PR ₁	—	—	52·9	63·4
Bombay	103·4	284	e 11 46	—	—	—	—	—
Pilar	E. 105·6	134	19 10	?PR ₁	—	—	56·2	58·9
St. Louis	E. 110·9	55	—	—	—	—	e 56·0	60·2
La Paz	111·3	119	e 19 1	?PR ₁	e 35 46	?SR ₁	57·5	58·9
Chicago	113·5	51	e 19 40	?PR ₁	30 10	+132	54·7	—
Ann Arbor	116·4	51	—	—	—	—	39·1	65·7
Toronto	119·7	50	—	—	i 26 34	-133	e 62·6	70·6
Georgetown	E. 121·1	56	—	—	32 50	? e 61·2	—	—
Washington	121·1	56	—	—	e 37 40	? e 61·7	—	—
Ithaca	121·7	51	—	—	—	—	62·7	—
Ottawa	122·3	49	e 20 40	?PR ₁	e 27 40	-86	61·2	—
Fordham	E. 123·7	53	45 51	? e 61·7	51 15	? e 65·7	—	—
Northfield	124·5	49	—	—	—	—	—	—
Helwan	142·2	290	19 40	[- 3]	23 23	?PR ₁	74·7	83·6
Dyce	N. 144·3	352	i 19 41	[- 6]	e 35 6	? e 62·7	—	—
Hamburg	145·0	340	i 19 47	[- 1]	—	—	—	82·7
Budapest	145·5	325	i 19 52	+ 3]	—	—	—	—
Edinburgh	145·7	353	19 40	[- 9]	—	—	—	—
Belgrade	146·2	320	e 19 55	+ 5]	e 32 13	? e 62·7	—	—
Eskdalemuir	N. 146·4	353	19 49	[- 1]	i 33 24	? e 60·7	99·1	—
Vienna	146·4	329	19 51	+ 1]	—	—	e 71·7	84·0
Stonyhurst	147·6	350	e 20 10	[+18]	—	—	—	110·7
De Bilt	147·7	343	19 56	[- 4]	—	—	e 62·7	84·4
Bidston	148·2	350	17 47	[-126]	20 57	? e 81·0	87·5	—
Zagreb	148·2	326	19 56	[+ 3]	—	—	e 50·7	83·7
Ucele	149·1	343	e 19 51	[- 3]	—	—	e 43·0	85·7
Innsbruck	N.W. 149·4	331	e 20 8	[+13]	e 40 34	? e 85·1	—	—
Oxford	149·5	349	20 1	[+ 6]	—	—	66·1	85·0
Kew	149·6	350	—	—	—	—	—	123·7
Strasbourg	149·9	333	e 19 57	[+ 1]	31 57	? e 50·7	103·3	—
Padova	150·6	328	20 20	[+23]	—	—	—	—
Paris	151·5	343	e 20 5	[- 7]	—	—	74·7	85·7
Besançon	151·7	337	e 20 20	[+22]	—	—	78·7	—
Florence	152·0	326	—	—	—	—	—	54·7
Rocca di Papa	152·6	321	e 19 58	[- 2]	—	—	—	—
Moncalieri	152·8	332	20 8	[- 8]	33 40	? e 45·7	—	—
Barcelona	158·0	335	—	—	e 82 54	?L	85·1	109·7
Tortosa	N. 159·3	337	e 19 40	[-27]	—	—	84·7	108·8
Algiers	161·4	326	e 20 8	[- 1]	e 31 6	? e 52·7	97·7	—
Coimbra	E. 161·8	356	—	—	32 43	? e 67·7	97·8	—
	N. 161·8	356	e 20 51	[+42]	31 57	? e 106·8	—	—
Granada	163·9	341	20 17	[+ 6]	33 4	? e 80·7	86·2	—
Rio Tinto	164·0	350	30 40	? e 112·7	—	—	—	—
San Fernando	165·2	348	79 52	?L	—	—	(79·9)	109·9

For Notes see next page.

NOTES TO MAY 12d. 18h. 39m. 20s.

Additional readings: Riverview $iPR_1 = +5m.1s.$, $iPR_2 = +5m.28s.$, $i = -8m.59s.$, $MN = +12.9m.$, $T_0 = 18h.39m.17s.$ Apia gives also $MN = +9.7m.$ Christchurch readings increased by 1h. Perth $PR_1 = +9m.5s.$, $SR_1 = +19m.20s.$, $SR_2 = +21m.55s.$ Honolulu $eN = +23m.24s.$ Batavia $iE = +15m.45s.$, $i = +21m.39s.$ Zi-ka-wei $PSZ = +21m.38s.$ $SRZ = +25m.18s.$ Lick $iN = +49m.35s.$ Victoria $L = +136.6m.$ La Paz $iP = +19m.35s.$ Ann Arbor $LN = +39.0m.$ Toronto $e = +30m.16s.$, $i = +42m.34s.$, $eL = +66.7m.$, $iL = +81.8m.$ Georgetown $LN = -64.0m.$, $LE = -65.7m.$ Ottawa $i = -24m.29s.$, $eE = -32m.51s.$ Northfield $L = +70.7m.$ Belgrade $PR_1 = +20m.25s.$, $PR_2 = +21m.8s.$, $PR_3 = +21m.48s.$, $e = +42m.20s.$, $+43m.29s.$, and $+44m.25s.$ Eskdalemuir $iN = +23m.11s.$, $i = +42m.21s.$, $MN = +90.0m.$ Vienna $iP = +19m.52s.$, $MN = +97.4m.$ Zagreb $MNW = +87.7m.$ Uccle $PR_1 = 23m.28s.$ Innsbruck $eLNE = +88.1m.$ Strasbourg $ePE = +20m.1s.$ (O-C = $[+5s.]$, $MN = +100.7m.$ Rocca di Papa $iP = +20m.6s.$ (O-C = $[+6s.]$). Barcelona $MN = +96.9m.$ Granada $i = +21m.15s.$, $-21m.51s.$, and $-24m.46s.$ San Fernando $MN = +108.7m.$

May 12d. Readings also at 0h., 1h., and 3h. (Riverview), 4h. (near Taihoku), 5h. (De Bilt), 8h. (Tacubaya, Riverview, and Manila), 13h. (Manila), 14h. (Apia), 19h. (Vienna), 20h. (Manila), 23h. (Riverview).

May 13d. Readings at 3h. (Vienna, Melbourne, Riverview, and Christchurch), 4h. (Taihoku), 10h. (Melbourne), 11h. (Apia), 13h. (La Paz and Manila), 16h. (near Belgrade), 21h. (La Paz).

May 14d. Readings at 1h. (Vienna and near Padova), 2h. (near Belgrade), 8h. (Christchurch), 9h. (La Paz), 13h. (Batavia), 15h. (Batavia, Tacubaya, and La Paz), 16h. (Honolulu), 18h. (near Tokyo and Mizusawa), 23h. (Ann Arbor, Ottawa, Tacubaya, Chicago, and Berkeley).

May 15d. 20h. 21m. 16s. Epicentre $41^{\circ}0'N. 144^{\circ}0'E.$ (as on 1919 June 23d.).

$$A = -.611, B = +.444, C = +.656; \quad D = +.588, E = +.809; \\ G = -.531, H = +.386, K = -.755.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		m.	s.	m.	s.	m.	s.	m.	m.
Mizusawa	E.	2.9	230	0 52	+ 7	1 25	+ 5	—	—
	N.	2.9	230	0 51	+ 6	1 23	+ 3	—	—
Sapporo		2.9	320	2 10	?	—	—	2.3	—
Ootomari		5.7	351	1 34	+ 6	(2 31)	- 5	2.5	4.2
Tokyo		6.3	214	1 44	+ 8	1 2 3	-49	1 2.9	3.0
Nagoya		8.0	226	1 55	- 6	(3 32)	- 5	3.5	4.0
Osaka		9.2	230	2 27	- 8	—	—	4.5	5.6
Kobe		9.4	231	2 14	- 8	—	—	5.0	5.0
Nagasaki		14.0	239	3 33	+ 7	(6 18)	+10	6.3	—
Zi-ka-wei		20.6	249	1 4 43	- 5	e 8 29	- 7	—	14.4
Taihoku	N.	24.6	236	e 5 18	-16	9 46	- 9	14.5	—
Hong Kong		31.2	240	10 34	?	—	—	—	—
Manila		33.1	224	e 6 44	-13	—	—	—	—
Tiflis		69.8	308	—	—	—	—	e 36.7	—
Konigsberg		72.8	330	—	—	—	—	e 41.7	46.7
Lemberg		75.4	324	—	—	—	—	e 42.2	45.3
Hamburg		77.5	334	1 12 4	0	—	—	e 40.7	45.7
Budapest		79.0	325	1 12 16	+ 3	—	—	—	—
Vienna		79.5	328	12 15	- 1	—	—	—	52.2
Eskdalemuir		79.8	342	—	—	—	—	—	52.6
De Bilt		80.3	336	—	—	e 22 32	+ 5	e 38.7	43.4
Belgrade		80.4	323	e 12 33	+12	(e 22 18)	-10	50.0	—
Stonyhurst		80.9	311	e 28 14	?SR ₁	36 26	?	—	52.9
Uccle		81.7	336	e 12 44	+15	e 22 44	+ 1	e 38.7	42.7
Zagreb		82.1	326	e 12 27	- 1	e 22 38	- 9	e 42.7	53.7

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Innsbruck	82.2	330	e 12 32	+ 1	—	—	—	—
Oxford	82.5	340	—	—	—	—	46.1	48.7
Kew	82.5	339	—	—	—	—	—	55.7
Strasbourg	82.6	333	12 36	- 2	e 23 31	+38	43.7	—
Paris	84.0	336	e 15 44	?	—	—	43.7	45.7
Besançon	84.3	333	e 13 02	-16	—	—	46.7	—
Florence	85.2	328	31 44	?L	—	—	(31.7)	53.6
Moncalieri	85.6	331	23 8	?S	(23 8)	-18	46.8	48.5
Rocca di Papa	86.3	326	—	—	23 50	+17	—	—
Tortosa N.	91.8	333	—	—	—	—	e 46.7	56.4
Algiers	91.5	330	—	—	—	—	e 50.7	59.7
Coimbra	95.0	340	e 5 44	?	e 17 44	?	51.7	—
Granada	96.4	335	18 10	?PR ₁	28 49	?	e 48.7	52.2
San Fernando	97.9	336	27 14	?S	(27 14)	+99	—	56.7
La Paz	143.2	58	19 41	[- 4]	—	—	69.0	77.0

Additional readings and notes : Osaka MN = +5.0m. Zi-ka-wei MNZ = +12.6m. Hamburg MZ = +49.7m. De Bilt ePR₁ = +15m.42s., MN = +52.6m. Epicentre 40° 0'N. 143° 5'E. Belgrade eS = +17m.29s. (?PR₁), true S being recorded as eL. Uccle SR₁ = +28m.8s., MN = +52.7m. Zagreb MNW = +48.7m. Innsbruck iNW = +12m.33s. Paris MN = +53.7m. Moncalieri S = +32m.27s., MN = +55.4m. Coimbra eN = +8m.39s. San Fernando MN = +65.7m.

May 15d. Readings Δ at 2h. (Manila), 4h. (Zi-ka-wei, De Bilt, and Calcutta), 6h. (near Tokyo and Mizusawa), 7h. (La Paz), 9h. (near Tokyo), 16h. (Tiflis).

May 16d. 8h. 6m. 45s. Epicentre 20° 0'N. 121° 0'E.

A = -184, B = +806, C = +342 ; D = +857, E = -515 ;
G = -176, H = -293, K = -940.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Hokoto	3.8	339	0 52	- 7	1 17	-27	1.3	—
Taihoku N.	5.1	6	e 1 25	- 6	—	—	2.5	2.7
Manila	5.4	180	e 1 29	+ 6	(2 31)	+ 3	2.5	3.6
Hong Kong	6.7	292	1 43	+ 1	—	—	4.2	4.9
Zi-ka-wei	11.2	2	e 2 48	+ 1	e 5 0	+ 1	—	9.4
Nagasaki	15.0	30	3 38	- 1	—	—	9.1	—
Kobe	19.4	37	4 32	- 2	8 27	+17	13.4	—
Osaka	19.5	38	4 40	+ 5	—	—	—	8.7
Nagoya	20.7	38	4 41	- 8	—	—	—	—
Tokyo	22.8	42	i 5 18	- 3	e 6 50	?	e 8.9	10.0
Mizusawa E.	25.8	38	5 33	-13	—	—	—	—
Batavia	29.7	209	e 6 17	- 8	i 11 57	+28	—	—
Calcutta	30.5	280	6 53	+20	—	—	—	—
Kodaikanal	43.0	265	23 15	?L	—	—	26.4	29.4
Konigsberg N.	79.4	325	—	—	—	—	e 47.2	50.2
Vienna	84.4	320	12 42	- 2	—	—	—	—
Zagreb	85.7	318	e 12 51	- 1	e 23 15	-12	e 47.2	58.2
Hamburg	85.7	326	—	—	—	—	e 46.2	54.2
De Bilt	89.0	325	—	—	e 23 33	-30	e 46.2	57.5
Strasbourg	89.4	322	—	—	—	—	—	54.2
Rocca di Papa	89.6	315	—	—	—	—	—	56.0
Uccle	90.1	325	e 23 33	?S (e 23 33)	—	-42	e 45.2	—
Edinburgh	90.8	331	—	—	—	—	—	58.2
Eskdalemuir	91.1	331	—	—	—	—	43.2	60.2
Moncalieri	91.2	320	e 14 1	+39	24 10	-16	45.2	—
Stonyhurst	91.7	329	e 30 39	?	—	—	—	59.8
Kew	92.1	327	—	—	—	—	—	60.2
Bidston	92.2	329	—	—	56 40	?L	(56.7)	61.8
Oxford	92.5	327	—	—	—	—	48.8	59.0
Coimbra	103.5	322	e 2 15	?	24 52	-97	35.2	—
La Paz	170.6	70	20 21	[- 6]	24 3	?PR ₁	—	—

Additional readings and notes : Hokoto readings have been increased by 1m. Manila MN = +3.4m. Zi-ka-wei MN = +8.7m., MZ = +8.8m. Mizusawa PN = +5m.34s. Konigsberg ME = +52.9m. De Bilt MN = +57.4m. Bidston S = +57m.35s.

May 16d. Readings also at 1h. (near Kobe), 2h. (Zi-ka-wei and Manila), 4h. (Zi-ka-wei, Konigsberg, Vienna, De Bilt, Strasbourg, Uccle, and Hamburg), 6h. (near La Paz) (2), 7h. (near Tokyo), 8h. (Manila, Taihoku, and La Paz (2)). These readings for La Paz are probably late phases of the above shock.) 9h. (near Athens), 10h. (Zi-ka-wei), 12h. (near Athens), 21h. (Rio Tinto), 23h. (near Tokyo).

May 17d. Readings at 6h. (Christchurch, Riverview, Melbourne, and Vienna), 11h. (Batavia), 18h. (near Nagoya, Osaka, and Kobe, and near Merida), 22h. (near Athens).

May 18d. Readings at 0h. (La Paz, Manila, and near Tacubaya), 2h. (near La Paz), 6h. (Ootomari), 7h. (Zante), 13h. (Batavia, Hong Kong, Manila, and Zi-ka-wei), 21h. (La Paz), 22h. (Rio Tinto), 23h. (near Kobe).

May 19d. Readings at 9h. (Zi-ka-wei), 11h. (Merida), 13h. (near Tokyo), 15h. (Paris), 19h. (Zi-ka-wei), 20h. (La Paz), 21h. (near Tacubaya).

May 20d. Readings at 1h. (near Athens), 2h. (Tiflis), 11h. (near Tacubaya), 15h. (near Mizusawa), 17h. (Manila (2)), 22h. (near Tokyo).

May 21d. 5h. 9m. 10s. Epicentre $3^{\circ}08.128^{\circ}0\text{E}$. (as on 1919 Feb. 17d.).

A = -615, B = +787, C = -052 ; D = +788, E = +616 ;
G = +032, H = -041, K = -999.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila		18.9	339	e 4 21	- 7	—	—	6.8	—
Batavia		21.3	260	e 4 56	- 1	i 8 56	+ 6	—	—
Hong Kong		28.7	333	6 8	- 7	(10 17)	-55	10.3	—
Zi-ka-wei		34.8	350	e 7 18	+ 7	e 12 4	-48	—	—
Riverview		37.7	146	—	—	e 15 8	+94	e 25.5	28.5
De Bilt	E.	112.0	324	—	—	—	—	e 55.8	64.9
	N.	112.0	324	—	—	—	—	e 57.8	66.3
Eskdalemuir		114.7	332	—	—	—	—	52.8	—

Batavia gives also $i = +7\text{m.8s.}$

Riverview $e = +18\text{m.26s.}$, $\text{MN} = +28.7\text{m.}$

May 21d. 15h. 40m. 40s. Epicentre $34^{\circ}08.73^{\circ}0\text{W}$.

A = -242, B = -793, C = -559 ; D = -956, E = -292 ;
G = -163, H = +535, K = -829.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mendoza		4.1	74	(0 50)	-14	—	—	0.8	1.6
Cipolletti		6.3	143	5 20	?	—	—	6.2	7.8
Andalgala	E.	8.6	43	3 50	?S	(3 50)	- 3	5.1	5.8
	N.	8.6	43	4 2	?S	(4 2)	+ 9	5.3	6.0
Chacarita	E.	12.1	97	3 2	+ 2	—	—	6.1	7.6
	N.	12.1	97	3 20	+20	—	—	6.2	6.6
La Quiaca	E.	13.5	30	4 14	+54	—	—	5.7	6.8
	N.	13.5	30	4 20	+60	—	—	5.8	6.8
La Paz		18.0	15	i 4 16	- 1	i 7 39	- 1	10.1	11.5
Coimbra		95.1	44	—	—	e 27 35	+148	e 48.3	—
Oxford		106.1	38	—	—	—	—	—	62.3
Bidston		106.2	36	50 25?	?L	55 20	?	(50.4?)	65.3
Eskdalemuir		107.3	34	—	—	e 25 20	-104	45.3	62.1
Moncalieri		107.5	46	—	—	—	—	e 58.1	—
Edinburgh		107.6	34	58 20	?L	—	—	(58.3)	—
Uccle		108.6	41	—	—	—	—	e 54.3	—
De Bilt	E.	109.7	41	—	—	e 28 32	+67	e 53.3	60.9
	N.	109.7	41	—	—	—	—	e 55.3	63.6
Hamburg		112.9	40	—	—	—	—	e 67.3	—
Zagreb		113.0	49	—	—	—	—	e 64.3	69.3
Colombo		143.1	131	76 20	?L	—	—	(76.3)	82.3

Additional readings: Coimbra gives also $e = +36\text{m.5s.}$
+28m.8s. Andalgala readings increased by 10 min.

Eskdalemuir $e =$

May 21d. Readings also at 1h. (Rocca di Papa, Chicago, La Paz, Eskdalemuir, De Bilt, and Zagreb), 2h. (De Bilt), 3h. (Hong Kong), 4h. (Zagreb, Rocca di Papa, and near Belgrade), 7h. (near Mostar), 12h. and 14h. (La Paz), 19h. (Colombo and Tokyo).

May 22d. 17h. 33m. 18s. Epicentre $7^{\circ}5'N$, $79^{\circ}0'W$. (as on 1918 Mar. 21d.).

$$A = +.189, B = -.973, C = +.130; \quad D = -.982, E = -.191; \\ G = +.025, H = -.128, K = -.991.$$

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Balboa Hts.	E.	1.6	346	0 22	- 2	0 41	- 4	0.7	0.8
	N.	1.6	346	0 26	+ 2	0 44	- 1	—	—
Ann Arbor	N.	35.1	354	—	—	—	—	21.7	—
Toronto		36.1	0	—	—	—	—	42.5	—
Ottawa		38.0	4	e 19 12	?L	—	—	e 26.7	—
Victoria		55.3	326	(11 58)	+137	—	—	12.0	14.9
Eskdalemuir		75.7	35	—	—	—	—	e 29.7	—
Uccle		80.0	39	—	—	—	—	e 34.7	—
De Bilt	E.	80.5	38	—	—	—	—	e 30.7	42.0
	N.	80.5	38	—	—	—	—	e 29.7	42.5
Strasbourg		87.4	41	—	—	e 25 42	?	—	—
Zi-ka-wei		136.7	333	—	—	—	—	e 87.9	—

May 22d. 18h. 4m. 40s. Epicentre $24^{\circ}0'N$, $120^{\circ}0'E$. (as on 1920 Oct. 20d.).

$$A = -.457, B = +.792, C = -.407; \quad D = +.866, E = +.500; \\ G = -.204, H = -.352, K = -.914.$$

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Hokoto		0.6	222	1 0	+51	—	—	1.3	—
Taihoku		1.8	53	0 34	+ 6	—	—	0.9	1.7
Hong Kong		5.6	254	1 47	+20	—	—	3.8	4.7
Zi-ka-wei		7.3	10	e 2 20	+29	e 3 40	-22	—	4.8
Manila		9.5	172	e 2 20	- 3	—	—	—	—
Nagoya		18.5	49	7 48	?S	(7 48)	- 3	—	—
Colombo		42.1	252	10 20	+128	14 20	-16	24.3	29.3
Kodaikanal		42.8	260	26 20	?L	—	—	(26.3)	—
Tiflis		63.6	309	—	—	—	—	e 35.3	42.3
Konigsberg	N.	75.8	325	—	—	—	—	e 40.3	43.3
Vienna		80.8	320	—	—	—	—	e 37.3	56.8
Hamburg		81.9	328	—	—	—	—	e 43.3	45.3
Zagreb		82.1	318	e 12 20	-11	—	—	45.3	55.3
De Bilt		85.2	326	—	—	e 23 22	+ 1	43.3	55.1
Dyce	N.	85.6	334	—	—	—	—	44.3	46.8
Strasbourg		85.7	322	—	—	—	—	e 47.3	—
Rocca di Papa		86.1	314	e 12 50	- 4	—	—	—	13.7
Uccle		86.3	327	—	—	—	—	e 44.3	48.3
Edinburgh		86.8	332	—	—	—	—	45.3	56.6
Eskdalemuir		87.2	332	—	—	—	—	41.3	49.6
Besançon		87.4	322	—	—	—	—	48.3	—
Moncalieri		87.6	319	14 3	+60	23 37	-11	45.0	57.3
Stonyhurst		87.8	330	e 24 20	?S	(e 24 20)	+30	—	52.3
Kew		88.2	329	—	—	—	—	—	56.3
Paris		88.4	326	—	—	—	—	e 47.3	—
Bidston		88.4	330	28 27?	?SR ₁	33 55	?	—	59.5
Oxford		88.6	329	—	—	—	—	43.3	58.0
Tortosa	N.	94.3	320	—	—	—	—	e 45.3	59.8
Coimbra		99.8	323	—	—	—	—	e 50.8	—
Rio Tinto		100.5	320	57 20	?L	—	—	(57.3)	67.3
Ottawa		109.1	12	—	—	—	—	57.3	—
Chicago		109.4	22	—	—	—	—	e 45.3	—

Additional readings and notes: Zi-ka-wei gives also MN = +5.6m., MZ = +5.7m. Konigsberg ME = +48.3m. Vienna readings are given 1h. late. De Bilt MN = +48.5m. Eskdalemuir MN = +57.0m. Moncalieri MN = +59.9m. Bidston P = +30m.20s., S = +35m.50s.?

May 22d. Readings also at 2h. (La Paz and Tokyo), 3h. and 6h. (La Paz), 11h. (near Athens (2), Belgrade, Rocca di Papa, Zagreb, and De Bilt), 12h. (Manila), 17h. (Sydney and Riverview), 18h. (Hokoto and Taihoku (3)).

May 23d. Readings at 1h. (La Paz), 3h. (Honolulu), 6h. (La Paz and near Rocca di Papa), 8h. (near Belgrade), 13h. (Manila), 21h. (near Balboa Heights (2)).

May 24d. 21h. 17m. 25s. Epicentre $44^{\circ}5'N$. $11^{\circ}5'E$. (as on 1920 June 8d.).

A = +699, B = +142, C = +701.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.7	0 13	+ 2	—	—	—	0.6
Padova	0.9	0 7	- 7	0 21	- 4	—	0.9
Moncalieri	2.7	0 20	-22	1 28	+14	2.8	—
Chur	2.7	0 47	+ 5	1 9	- 5	—	—
Innsbruck	2.7	i 0 38	- 4	—	—	—	—
Rocca di Papa	2.8	e 0 53	+ 9	e 1 35	+18	(e 1.6)	2.0
Zagreb	3.4	0 57	+ 4	i 1 37	+ 3	—	2.0
Zurich	3.5	e 0 58	+ 3	i 1 29	- 8	—	—
Strasbourg	4.8	e 1 45	+31	e 2 3	- 8	—	—
Vienna	5.0	e 1 27	+10	—	—	—	3.2

Additional readings : Rocca di Papa gives also iSE = +1m.41s., eSN = +1m.47s.
Zagreb iSNW = +1m.39s. Zurich eS = +1m.27s.

May 24d. Readings also at 1h. (Zi-ka-wei and Taihoku), 2h. (De Bilt and Hong Kong), 6h. (Taihoku), 8h. (Zi-ka-wei, Riverview, De Bilt, Manila Honolulu, Melbourne, and near Tokyo), 9h. (Riverview), 10h. (near Tokyo), 15h. (Batavia, Zi-ka-wei, and Manila), 17h. (near Mizusawa), 19h. (La Paz and near Tacubaya), 20h. (Rio Tinto), 21h. (De Bilt), 22h. (La Paz).

May 25d. 4h. 23m. 20s. Epicentre $44^{\circ}5'N$. $11^{\circ}5'E$. (as on 24d.).

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.7	0 8	- 3	—	—	—	0.4
Padova	0.9	0 2	-12	0 11	-14	—	0.6
Innsbruck	2.7	e 0 40	- 2	—	—	—	—
Moncalieri	2.7	e 0 31	-11	1 29	+15	3.0	—
Rocca di Papa	2.8	1 34	+50	—	—	i 1.7	—
Zagreb	3.4	e 0 52	- 1	e 1 34	0	—	1.9

Additional readings : Rocca di Papa e = +4s. Zagreb MNE = +2.0m.

May 25d. Readings also at 1h. (Malaga and near Granada), 3h. (near Tokyo), 4h. (La Paz), 9h. (near Tokyo), 10h. (Riverview), 14h. (near La Paz), 15h. (Taihoku), 20h. (Batavia).

May 26d. 8h. 34m. 18s. Epicentre $42^{\circ}5'N$. $7^{\circ}5'E$. (as on 1919 July 12d.).

A = +731, B = +096, C = +676 ; D = +130, E = -991 ;
G = +669, H = +088, K = -737.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	3.9	99	i 1 0	- 1	i 1 48	+ 1	—	2.1
Padova	4.3	46	0 39	-28	(2 5)	+ 7	—	2.1
Chur	4.5	17	1 45	+35	—	—	—	—
Zurich	4.9	9	i 1 49	+33	i 3 17	?	—	—
Pompeii	5.5	106	0 22	-63	—	—	—	—
Strasbourg	6.0	2	i 1 36	+ 4	e 2 35	- 9	—	—
Zagreb	7.0	58	1 35	-11	e 2 45	-25	—	3.0
Gottingen	9.1	10	i 2 30	+12	—	—	—	—
Belgrade	9.6	72	e 3 0	+36	i 3 21	-57	—	—

Additional readings : Strasbourg gives also P = +1m.37s. Zagreb MNW = +2.8m. Belgrade iP = +3m.14s.

May 26d. Readings also at 5h. (La Paz), 9h. (Honolulu), 15h. (Manila and Taihoku), 18h. and 19h. (Rio Tinto).

May 27d. Readings also at 0h. (Zurich and Chur), 1h. (Vienna), 2h. (Florence, Zagreb (2), Pompeii, Rocca di Papa (4), and Padova), 3h. (Rocca di Papa (2)), 5h. and 10h. (Rocca di Papa), 13h. (La Paz), 15h. (Rocca di Papa), 23h. (Coimbra, Manila, and Rocca di Papa).

May 28d. 12h. 9m. 0s. Epicentre $37^{\circ}2'N$, $139^{\circ}0'E$. (as on 1922 April 28d.).

$$A = -.601, B = -.522, C = -.605.$$

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo		1.7	10 21	- 5	10 35	-13	—	0.6
Mizusawa	E.	2.5	0 38	- 1	1 10	+ 1	—	—
	N.	2.5	0 39	0	1 9	0	—	—
Nagoya		2.7	0 42	0	—	—	1.9	1.8
Osaka		3.9	1 7	- 6	—	—	2.3	2.9
Zi-ka-wei	Z.	15.7	0 3 38	-10	—	—	—	—

Additional readings: Tokyo gives $36^{\circ}8'N$, $139^{\circ}8'E$. Osaka MN = $+2.6m$.
Kobe ($\Delta = 4^{\circ}0'$) gives P = 12h.16m.

May 28d. Readings also at 0h. (Ottawa, Rocca di Papa, Melbourne, Riverview, De Bilt, Zi-ka-wei, Chicago, and Apia), 1h. (Zagreb, Eskdalemuir, Uccle, and near Mostar), 4h. (Zi-ka-wei, Riverview, Apia, Melbourne, and Chicago), 5h. (Ann Arbor, De Bilt, Ottawa, and Eskdalemuir), 13h. (Azores and Riverview), 14h. (Vienna), 15h. (Eskdalemuir, Uccle, Bidston, De Bilt, Zagreb, and near Athens), 16h. (Paris), 18h. (Belgrade).

May 29d. Readings at 1h. (Vienna), 8h. (Nagasaki), 11h. (Sydney, Adelaide, Riverview, Melbourne, Zi-ka-wei, and La Paz), 12h. (De Bilt), 19h. (De Bilt), 20h. (Manila and Batavia).

May 30d. Readings at 2h. (near Tokyo), 5h. (Chur and Zurich), 8h. (Kingston), 9h. (Zi-ka-wei), 12h. (Taihoku), 18h. (Manila and Zi-ka-wei), 21h. (Rio Tinto and near La Paz), 23h. (Taihoku).

May 31d. Readings at 1h. (near Lick and Berkeley), 3h. (La Paz (2)), 4h. (Zi-ka-wei), 6h. (near Tacubaya), 7h. (Manila (2) and La Paz (2)), 8h. (near Tokyo), 9h. (Manila), 10h. (La Paz), 13h. (Granada), 15h. (La Paz), 17h. (Zagreb, Coimbra, and near Belgrade), 20h. (Zi-ka-wei and near Taihoku).

June 1d. 16h. 18m. 26s. Epicentre $19^{\circ}5'N$, $120^{\circ}0'E$.

$$A = -.471, B = +.816, C = +.334; \quad D = +.866, E = +.500; \\ G = -.167, H = +.289, K = -.943.$$

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	5.0	169	1 17	0	(2 17)	0	2.3	3.5
Taihoku	5.7	14	0 1 28	0	—	—	2.3	—
Hong Kong	6.1	299	1 31	- 2	—	—	—	4.6
Zi-ka-wei	11.8	6	—	—	0 5 16	- 2	—	8.5
De Bilt	88.8	326	—	—	—	—	e 48.6	57.2
Strasbourg	89.2	322	—	—	—	—	52.1	—
Uccle	89.9	325	—	—	—	—	e 46.6	—
Eskdalemuir	91.1	332	—	—	—	—	44.6	—

Additional readings: Manila gives also MN = $+3.9m$. De Bilt MN = $+57.1m$.
Strasbourg reading has been decreased by 1h.

June 1d. Readings also at 0h. (La Paz), 3h. (Taihoku), 21h. (near Tokyo).

1922. June 2d. 20h. 11m. 35s. Epicentre 8°0'N. 128°0'E.

(as on 1921 Nov. 11d.).

A = -·610, B = +·780, C = +·139; D = +·788, E = +·616;

G = -·086, H = +·110, K = -·990.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	9·5	314	e 2 35	+12	5 10	?L	6·5	7·1
Taihoku	18·1	341	4 32	+14	(7 54)	+12	7·9	—
Hong Kong	19·6	319	4 35	- 1	—	—	9·0	15·2
Zi-ka-wei	24·0	346	i 5 28	0	e 9 44	0	e 11·1	18·8
Nagasaki	24·8	4	5 37	+ 1	(10 19)	+20	10·3	—
Batavia	25·5	237	i 5 32	-11	19 50	-23	—	12·5
Osaka	27·5	13	6 6	+ 3	—	—	12·5	18·0
Kobe	27·5	13	6 6	+ 3	—	—	12·8	14·4
Tokyo	29·7	20	7 41	+76	e 10 31	+62	e 13·3	—
Mizusawa	E. 33·3	19	6 57	- 2	12 26	- 3	—	—
Calcutta	40·8	297	7 51	-10	17 39	?SR ₁	26·2	—
Adelaide	44·1	167	—	—	e 14 43	-26	e 21·4	26·9
Riverview	47·2	154	e 8 41	- 7	e 15 27	-17	e 21·3	—
Colombo	47·8	271	8 55	+ 2	16 1	+10	27·4	35·4
Melbourne	48·4	161	8 46	-10	15 49	-10	23·3	28·7
Kodaikanal	49·9	277	7 37	?	—	—	22·5	35·3
Bombay	54·5	288	10 39	+63	—	—	—	—
Honolulu	E. 72·3	70	11 45	+13	22 25	+91	39·5	42·9
	N. 72·3	70	11 57	+25	22 21	+87	—	—
Tiflis	79·7	311	12 31	+14	22 37	+17	38·4	42·4
Helwan	91·7	301	i 13 20	- 5	23 45	-47	—	61·9
Lemberg	92·8	321	e 13 1	-30	e 36 7	?	51·4	62·0
Upsala	93·1	332	e 12 57	-36	e 23 53	-53	e 48·0	62·0
Konigsberg	93·3	326	13 30	- 4	24 42	- 6	e 49·9	59·0
Victoria	96·1	40	26 36	?S	(26 36)	+79	44·6	51·0
Belgrade	96·8	318	e 13 20	-33	e 23 26	?	63·5	—
Vienna	98·0	321	i 13 48	-12	25 21	-15	49·4	64·9
Zagreb	99·3	319	e 13 55	-12	i 25 22	-27	e 42·4	54·4
Hamburg	99·4	328	e 13 55	-12	e 24 25	-95	e 48·4	63·4
Berkeley	100·3	49	—	—	e 29 37	?	e 48·4	—
De Bilt	102·7	328	—	—	e 24 49	-92	e 48·4	66·9
Rocca di Papa	102·9	316	18 1	?PR ₁	—	—	e 20·4	—
Florence	103·1	318	52 25	?L	—	—	(52·4)	66·4
Strasbourg	103·1	322	i 14 15	-11	27 26	+61	62·4	—
Dyce	N. 103·2	335	18 34	?PR ₁	24 49	-97	55·4	59·4
Uccle	103·8	327	e 24 55	?S	e 33 19	?	e 48·4	66·4
Edinburgh	104·5	333	57 25	?L	(i 26 9)	-29	(57·4)	62·4
Besançon	104·7	323	e 25 45?	?S	(e 25 45?)	-54	61·4	—
Moncalieri	104·8	321	e 18 50	?PR ₁	28 17	+97	57·7	—
Eskdalemuir	104·9	333	e 18 55	?PR ₁	e 26 13	-28	50·4	—
Stonyhurst	105·5	331	e 8 25	?	—	—	—	16·9
Paris	105·9	325	—	—	e 25 4	-107	58·4	74·4
Kew	105·9	330	—	—	—	—	—	78·4
Bidston	106·0	331	—	—	—	—	—	61·2
Oxford	106·2	330	—	—	25 1	-113	—	64·2
Tortosa	N. 111·4	320	e 18 25	[- 1]	28 50	+69	e 56·4	83·4
Algiers	111·8	314	e 19 28	?PR ₁	29 28	+104	e 54·4	69·9
Granada	116·1	318	e 18 57	[+16]	i 31 21	?	e 50·4	78·8
Coimbra	117·3	323	18 19	[-26]	29 43	+75	e 49·3	—
Rio Tinto	117·7	320	64 25	?L	—	—	(64·4)	77·4
Chicago	120·5	29	20 9	?PR ₁	30 11	+78	e 49·8	—
Ann Arbor	122·0	25	—	—	20 49	?PR ₁	73·4	—
Ottawa	122·5	18	i 20 49	?PR ₁	c 31 25	?	e 55·4	—
Toronto	122·7	21	—	—	—	—	55·3	—
Georgetown	E.N. 127·6	22	—	—	21 25	?PR ₁	87·4	—
Washington	127·6	22	20 5	?PR ₁	29 39	- 5	—	—
Port au Prince	146·7	35	c 24 19	?PR ₁	—	—	—	24·4
La Paz	162·1	120	20 23	[+14]	35 2	?	80·3	83·8

Additional readings and notes : Manila gives also MN = +7·0m. Zi-ka-wei
 PSE = +9m.58s., PSN = +10m.4s., PSZ = +10m.8s., SR₁E = +10m.20s.,
 SR₁N = +10m.25s., MZ = +15·2m., MN = +16·7m. Batavia i =
 +6m.53s. and +7m.12s. Osaka MN = +19·0m. Kobe MN =
 +18·8m. Mizusawa PN = +6m.56s. Melbourne PR₁ = +10m.49s.

Notes continued on next page.

Honolulu $SR_1N = -28m.25s.$, $SR_2N = +32m.35s.$, $T_0 = 20h.10m.38s.$ Tiflis
 $MN = +43.2m.$ Upsala $MN = +64.1m.$ Königsberg $SN =$
 $+24m.38s.$, $MN = +56.3m.$ Victoria readings diminished by 1h.
Belgrade $L = +73.8m.$ Vienna $i = +24m.47s.$ Hamburg $MN =$
 $+66.4m.$ Berkeley $eLNZ = -47.4m.$ De Bilt $ePR_1 = -18m.30s.$
 $MN = +72.6m.$ Florence readings have been increased by 1h. Stras-
bourg $PR_1 = +18m.49s.$ Edinburgh $iM = +26m.9s.$ (?) S. Eskdale-
muir $e = -24m.59s.$ Stonyhurst readings are possibly 1h. in error.
Paris $MN = +64.4m.$ Granada $iP = +19m.9s.$, $i = +21m.21s.$, and
 $+27m.20s.$, $MN = +81.0m.$ Chicago $L = +66.4m.$ and $+86.4m.$
Ann Arbor $LE = +87.4m.$ Ottawa $e = +38m.57s.$ Toronto $L? =$
 $+41.0m.$ and $L = +75.6m.$ Georgetown $LN = +68.4m.$ Port au
Prince may record a local shock.

June 2d. Readings also at 0h. (Colombo), 11h. (Manila), 12h. (near Kobe), 15h.
(near Tokyo), 16h. (Manila), 18h. (Ootomari), 19h. (Rio Tinto), 22h.
(Perth).

June 3d. 4h. 14m. 0s. Epicentre $37^\circ 4'N.$ $30^\circ 5'E.$ (as on 1918 July 4d.).

A = -0.684 , B = -0.403 , C = $+0.607$; D = -0.508 , E = -0.862 ;
G = $+0.523$, H = $+0.308$, K = -0.794 .

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	5.4	278	i 1 20	- 3	(2 30)	+ 2	i 2.5	2.8
Helwan	7.6	174	1 58	+ 3	3 10	-16	—	3.3
Zagreb	13.7	313	e 3 24	+ 2	—	—	—	8.1
Rocca di Papa E.	14.4	293	i 3 24	- 8	—	—	—	—
Vienna Z.	14.9	321	i 3 44	+ 6	—	—	—	6.9
Strasbourg	19.9	311	e 4 45	+ 5	—	—	—	—
Hamburg Z.	21.5	326	e 5 1	+ 2	—	—	—	—
De Bilt	23.0	318	—	—	e 9 54	+29	—	—

Rocca di Papa gives also $iPN = +4m.33s.$ (O-C = $+1s.$). Vienna $iPz =$
 $+3m.50s.$

June 3d. 4h. 56m. 30s. Epicentre $37^\circ 0'N.$ $141^\circ 0'E.$ (as on 1922 Feb. 15d.).

A = -0.621 , B = $+0.502$, C = $+0.602$; D = $+0.629$, E = $+0.777$;
G = -0.468 , H = $+0.379$, K = -0.799 .

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	1.7	217	i 0 25	- 1	0 44	- 4	—	—
Mizusawa E.	2.1	2	0 39	- 6	1 10	+12	—	—
Nagoya	3.8	242	0 53	- 6	1 38	- 6	1.6	1.8
Osaka	5.1	245	1 31	+12	—	—	2.6	4.0
Kobe	5.3	246	0 20	-62	2 6	-19	2.9	4.1
Zi-ka-wei	17.2	256	e 4 7	0	e 7 24	+ 2	—	11.5
Manila	28.7	224	e 6 30	+15	—	—	—	—
Königsberg	75.0	330	—	—	—	—	e 47.2	48.0
Hamburg	80.0	334	—	—	—	—	e 42.5	—
Vienna	81.6	327	i 12 17	-11	—	—	—	13.2
De Bilt E.	83.0	335	—	—	e 22 48	- 9	e 43.5	52.8
N.	83.0	335	—	—	—	—	e 44.5	53.5
Zagreb	83.5	325	—	—	—	—	e 46.5	53.5
Stonyhurst	83.8	339	e 43 42	?L	—	—	(e 43.7)	55.5
Uccle	84.3	335	—	—	e 23 0	-11	e 43.5	—
Bidston	84.4	339	—	—	51 7	?L	(51.1)	56.2
Strasbourg	85.0	331	—	—	e 52 0	?L	56.0	—
Paris	86.6	334	—	—	—	—	e 52.5	54.5
Rocca di Papa	88.2	324	i 13 3	- 3	—	—	—	—
Ottawa	91.2	25	—	—	—	—	e 51.5	—
La Paz	147.1	60	19 45	[- 6]	—	—	—	—

Additional readings: Mizusawa gives also $PN = +0m.38s.$ Nagoya $MN =$
 $+2.0m.$ Osaka $MN = +3.5m.$ Kobe $MN = +3.0m.$ Bidston $S =$
 $+51m.24s.$ (?) L. Paris $MN = +58.5m.$ Rocca di Papa $iPN = +13m.0s.$
 $PR_1 = +16m.18s.$

June 3d. Readings also at 0h. (near Belgrade), 1h. (Ottawa, Manila, Chicago, and near Mazatlan), 2h. (Taihoku), 5h. (near Belgrade), 6h. (Apia), 8h. (near Colima), 9h. (Zi-ka-wei), 14h. (Azores), 21h. (Rio Tinto), 23h. (near Tacubaya).

June 4d. 17h. 48m. 24s. Epicentre $38^{\circ}0'N$. $23^{\circ}5'E$. (as on 1918 Jan. 1d.).

$A = +.723$, $B = +.314$, $C = +.616$.

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Athens	0.2	0 6	+ 2	—	—	0.5	0.6
Belgrade	7.2	e 1 53	+ 4	e 3 13	- 2	5.1	—
Rocca di Papa	9.1	e 1 58	-20	—	—	—	6.4
Zagreb N.E.	9.6	e 2 18	- 6	—	—	—	5.6
De Bilt	19.0	—	—	—	—	e 10.1	—

Additional readings: Athens gives also $iP = +8s$.
+ 1m.53s. Zagreb MNW = +6.1m.

Rocca di Papa $ePN =$

June 4d. Readings also at 7h. (near Tacubaya), 9h. (near Taihoku), 12h. and 16h. (Manila), 17h. (near La Paz), 21h. (Manila and Ottawa), 23h. (near Batavia and near Colima).

June 5d. 4h. 31m. 5s. Epicentre $35^{\circ}0'N$. $22^{\circ}5'E$.

$A = +.757$, $B = +.313$, $C = +.574$; $D = +.383$, $E = -.924$;

$G = +.530$, $H = +.220$, $K = -.819$.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Athens	3.1	18	e 0 54	+ 5	i 1 38	+12	i 2.0	2.0
Pompeii	8.5	315	2 25	+16	3 50	0	—	5.8
Mostar	9.0	338	i 3 24	+68	i 4 15	+12	i 4.5	4.8
Helwan	9.1	122	i 2 12	- 6	3 50	-16	—	7.3
Belgrade	9.9	352	i 3 20	-51	i 4 18	- 8	i 4.5	6.3
Rocca di Papa	10.2	314	e 2 33	0	i 5 1	+26	6.5	—
Zagreb N.E.	11.9	337	2 58	0	5 4	-13	e 5.5	—
N.W.	11.9	337	2 52	- 6	5 5	-12	—	8.5
Budapest	12.7	350	e 3 21	+12	e 6 7	+30	e 8.4	—
Padova	13.1	325	3 17	+ 3	7 40	?L	(7.3)	11.3
Vienna	14.0	343	3 37	+11	6 21	+13	e 7.8	9.9
Innsbruck N.E.	14.8	329	e 3 35	- 1	e 6 36	+ 9	e 8.4	9.9
Lemberg	14.8	4	e 3 55	+19	—	—	e 7.8	9.3
Moncalieri	15.0	316	3 46	+ 7	7 2	+30	9.3	13.2
Algiers	15.8	282	i 3 55	- 6	7 3	+13	—	12.4
Zurich	16.1	324	e 3 54	1	i 7 6	+ 9	—	—
Barcelona	17.2	298	4 12	5	—	—	e 9.5	16.6
Besançon	17.3	320	4 20	-11	7 35	+10	11.9	—
Strasbourg	17.4	326	3 59	-11	7 22	- 5	e 10.3	12.8
Tortosa N.	18.2	295	4 23	+ 4	7 50	+ 6	—	14.6
Puy de Dôme	18.2	312	2 5	?	—	—	—	—
Tiflis	18.7	62	e 4 37	+12	e 7 37	-18	e 11.6	13.1
Konigsberg	19.9	357	e 4 42	+ 2	8 21	0	e 11.6	11.9
Paris	20.2	320	e 4 45	+ 2	8 28	+ 1	11.9	14.9
Uccle	20.5	326	e 4 45	- 2	8 38	- 4	e 11.5	—
Hamburg	20.5	339	4 43	1	e 8 41	+ 7	e 11.2	14.5
De Bilt	21.1	329	4 57	3	8 14	2	11.4	13.7
Granada	21.1	284	i 4 52	2	i 9 3	-17	e 11.9	20.8
Rio Tinto	23.5	285	9 55	?S	(9 55)	20	—	20.9
Oxford	23.8	322	5 27	+ 1	9 15	-25	13.9	16.4
Coimbra	24.9	291	e 5 43	- 6	10 9	8	e 13.1	21.7
Upsala	25.0	354	e 5 32	- 6	9 58	- 5	e 13.4	15.1
Stonyhurst	25.7	325	9 55	?S	(9 55)	-21	(14.4)	19.4
Bidston	25.7	324	7 12	?	11 10	+54	—	18.0
Edinburgh	27.2	328	10 55	?S	(10 55)	+10	—	17.9
Dyce N.	27.7	331	—	—	10 30	-24	14.1	16.6
Chicago	80.1	315	e 12 25	- 5	—	—	39.9	—
La Paz	99.8	257	13 58	-12	—	—	—	—

Additional readings: Athens gives also $iP = +0m.58s$, $iEN = +1m.28s$, $MN = 2.8m$, $T_0 = 4h.31m.3s$.
Rocca di Papa $eL = +10.4m$, $L = +12.9m$.
Moncalieri MN = +14.3m. Tiflis MN = +15.0m. Konigsberg MNZ = +14.6m.
Paris MN = +12.9m, $T_0 = 4h.31m.10s$. Hamburg MZ = +14.4m, MN = +16.2m.
Granada $i = +5m.4s$. Coimbra $eSN = +10m.21s$, $T_0 = 4h.31m.14s$.
Upsala MN = +17.4m.

June 5d. 13h. 58m. 0s. Epicentre $42^{\circ}0'N$. $146^{\circ}0'E$.

A = -616, B = +416, C = +669; D = +559, E = +829;

G = -555, H = +374, K = -743.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	4.7	234	1 11	- 2	1 56	-13	—	—
Ootomari	5.2	334	1 28	+ 8	—	—	2.6	3.4
Tokyo	8.0	220	e 3 39	?S	(e 3 39)	+ 2	e 5.8	5.9
Osaka	11.0	232	3 25	+41	—	—	—	5.0
Kobe	11.2	233	3 19	+32	—	—	6.4	—
Zi-ka-wei	22.4	249	4 56	-14	e 8 56	-17	—	13.2
Manila	34.9	225	—	—	c 13 0	+ 6	—	—
Tiflis	70.3	309	—	—	—	—	e 16.0	48.7
Hamburg	77.2	335	—	—	—	—	e 40.0	42.0
Vienna	79.4	329	—	—	—	—	e 44.0	50.5
De Bilt	E. 80.0	337	—	—	e 22 22	- 1	e 40.0	44.3
N. 80.0	337	—	—	—	—	—	e 42.0	44.5
Budapest	80.2	326	—	—	—	—	e 42.2	—
Belgrade	80.5	324	—	—	(e 22 0)	-29	e 22.0	—
Bidston	80.9	341	—	—	—	—	—	55.8
Uccle	81.4	337	—	—	—	—	e 42.0	—
Zagreb	81.6	328	—	—	—	—	e 37.0	53.0
Strasbourg	82.3	334	—	—	—	—	44.0	—
Paris	83.7	338	—	—	—	—	e 45.0	46.0
Rocca di Papa	86.3	327	—	—	—	—	e 45.5	55.2
Coimbra	94.6	341	39 50	? e 45 30	?L	e 52.0	—	—
Rio Tinto	96.5	339	—	—	—	—	54.0	72.0

Additional readings: Ootomari gives also MN = +3.8m. Zi-ka-wei MZ = +13.7m. Tiflis MZ = 49.6m. Bidston M is corrected by -1h.

Zagreb MNW = +47.0m.

June 5d. 15h. 42m. 20s. Epicentre $42^{\circ}0'N$. $146^{\circ}0'E$. (as at 13h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	4.7	234	1 12	- 1	1 59	-10	—	—
Ootomari	5.2	334	1 32	+12	—	—	2.6	—
Tokyo	8.0	220	e 3 18	?S	(e 3 18)	-19	e 4.6	4.7
De Bilt	80.0	337	—	—	e 22 46	+23	e 40.7	43.9

Additional readings: Mizusawa gives also PN = +1m.13s. De Bilt cLN = +42.7m.

June 5d. Readings also at 2h. (Zagreb), 9h. (Manila), 10h. (Taihoku and Zi-ka-wei), 16h. (De Bilt), 17h. (Strasbourg), 21h. (La Paz).

June 6d. Readings at 2h. and 6h. (Manila), 8h. (Zi-ka-wei), 11h. (Manila and Innsbruck), 15h. (Malaga and near Granada), 18h. (Colombo and near Tacubaya), 22h. (Taihoku).

June 7d. 17h. 52m. 56s. Epicentre $37^{\circ}0'N$. $138^{\circ}5'E$. (as on 1922 March 18d.).

A = -599, B = +529, C = -602; D = +663, E = -749;

G = -451, H = +399, K = -799.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	1.6	142	i 0 26	- 2	i 0 37	- 8	i 1.0	1.0
Nagoya	2.2	214	0 56	-22	(0 56)	- 4	1.2	2.2
Mizusawa	2.9	44	0 46	- 1	1 32	+12	—	—
Osaka	3.5	227	1 35	?S	(1 35)	- 2	2.9	3.6
Kobe	3.6	230	1 34	?S	(1 34)	- 5	2.7	—
Zi-ka-wei	Z. 15.3	253	—	—	—	—	e 8.2	—

No additional readings.

June 7d. Readings also at 9h. (La Paz), 14h. (Tortosa), 16h. (La Paz).

June 8d. 6h. 49m. 25s. Epicentre $43^{\circ}0'N$, $146^{\circ}0'E$. (as on 1921 Aug. 9d.).

$$A = -.606, B = +.409, C = +.682; \quad D = +.559, E = +.829; \\ G = -.565, H = +.382, K = -.731.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ootomari		4.3	328	1 12	+ 5	(1 59)	+ 1	2.0	—
Mizusawa	E.	5.3	225	1 30	+ 8	2 32	+ 7	—	—
Tokyo		8.8	216	e 2 35	+22	—	—	e 2.8	2.9
Zi-ka-wei	Z.	22.7	247	e 5 6	- 7	—	—	—	—
Hamburg	Z.	76.3	334	i 11 44	-13	—	—	—	—
Vienna	Z.	78.6	329	e 11 57	-14	—	—	—	—
Zagreb		80.7	327	e 12 11	-12	—	—	—	—

Mizusawa gives also $PN = +1m.28s$.

June 8d. 7h. 47m. 40s. Epicentre $43^{\circ}0'N$, $12^{\circ}5'E$. (as on 1919 Sept. 10d.).

$$A = +.714, B = +.158, C = +.682; \quad D = +.216, E = -.976; \\ G = +.666, H = +.148, K = -.731.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Florence		1.2	311	0 25	+ 7	—	—	—	0.9
Rocca di Papa		1.3	173	i 0 20	0	i 0 42	+ 6	—	1.1
Padova		2.4	349	0 44	+ 7	1 7	+ 1	1.4	2.4
Pompei		2.7	147	e 0 58	+16	1 28	+14	—	—
Zagreb		3.8	40	e 0 55	- 4	1 35	- 9	—	2.1
Moncalieri		4.0	302	—	—	—	—	e 2.4	—
Zurich		5.2	329	e 1 21	+ 1	2 56	?L	(2.9)	—
Vienna	Z.	5.9	26	e 2 11	+40	—	—	—	3.2
Belgrade		6.0	70	e 1 25	- 7	e 2 55	+11	—	3.4
Strasbourg		6.5	330	—	—	e 2 47	-10	—	3.9
De Bilt		10.3	334	—	—	—	—	e 6.3	—
Hamburg		10.7	352	—	—	—	—	e 6.3	—

Zagreb gives also $MNW = +1.8m$.

June 8d. Readings also at 3h., 5h., and 8h. (La Paz), 9h. (La Paz and Strasbourg), 10h. (Zi-ka-wei), 11h. (Ottawa, Chicago, Georgetown, and Ann Arbor), 13h. (La Paz), 14h. (Strasbourg), 18h. (Batavia), 19h. and 20h. (2) (Rio Tinto), 21h. (Zi-ka-wei and near Manila).

June 9d. 15h. 36m. 26s. (I) Epicentre $43^{\circ}0'N$, $21^{\circ}0'E$.
16h. 13m. 20s. (II)

$$A = +.683, B = -.262, C = +.682; \quad D = +.358, E = -.934; \\ G = +.637, H = +.244, K = -.731.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
I Belgrade		1.9	348	i 0 56	+27	i 1 33	+40	—	1.8
II		1.9	348	i 0 57	+28	i 1 33	+40	—	1.7
I Mostar		2.3	279	i 0 1	-35	i 0 14	-49	—	0.4
II		2.3	279	i 0 37	+ 1	i 0 51	-12	—	1.0
I Sinj		3.2	282	e 0 51	+ 1	i 1 11	-17	—	1.4
II		3.2	282	e 0 51	+ 1	i 1 11	-17	—	1.3
I Zagreb	N.W.	4.5	310	e 1 17	+ 7	i 1 37	-27	—	3.4
II	N.W.	4.5	310	e 1 16	+ 6	i 1 37	-27	—	3.2
I Budapest		4.7	345	e 1 45	+32	e 2 48	+39	3.8	—

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		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
I Pompeii		5.3	247	e 1 19	- 3	3 14	?L	(3.2)	—
II		5.3	247	e 1 10	-12	3 20	?L	(3.3)	—
I Athens		5.5	156	e 1 15	-10	2 37	+ 6	e 2.9	3.3
II	F.	5.5	156	e 1 23	- 2	2 43	+12	e 2.9	3.0
II	N.	5.5	156	e 1 20	- 5	2 34	+ 3	—	3.2
I Vienna		6.2	331	e 2 42	?5	(e 2 42)	- 7	i 4.0	5.3
II		6.2	331	e 2 8	+33	—	—	i 3.6	5.2
I Rocca di Papa		6.2	261	i 1 41	+ 6	—	—	—	3.9
II		6.2	261	i 1 46	+11	—	—	—	4.2
I Padova		7.0	293	3 10	?5	(3 10)	0	4.1	—
II		7.0	293	3 8	?5	(3 8)	- 2	4.9	5.2
I Innsbruck		8.0	306	e 3 37	?5	(e 3 37)	0	e 4.6	—
II		8.0	306	e 2 4	+ 3	—	—	—	—
I Moncalieri		9.7	286	5 5	?L	—	—	(5.1)	—
II		9.7	286	3 14	+48	—	—	5.8	—
I Zurich		9.8	301	e 2 31	+ 4	i 4 33	+10	—	5.4
II		9.8	301	e 2 28	+ 1	e 4 33	+10	—	—
I Strasbourg		10.8	306	e 5 15	?5	(e 5 15)	+25	e 6.1	—
II		10.8	306	e 5 14	?5	(e 5 14)	+24	e 6.1	—
I Hamburg		12.8	330	—	—	—	—	e 6.6	—
II		12.8	330	—	—	—	—	e 7.7	—
I De Bilt		14.0	316	—	—	—	—	e 8.2	9.6
II		14.0	316	—	—	—	—	e 8.2	9.6

Additional readings: Athens I gives also $i = +2m.0s.$, $MN = +3.4m.$ Vienna I $i = +4m.32s.$, II $i = +4m.30s.$ Padova readings at I $+6m.48s.$ and $+6m.11s.$ Rocca di Papa I $PR_1 = +2m.34s.$, II $PR_1E = +2m.47s.$, and $PR_1N = +2m.51s.$ Zurich I alternative $P = +2m.28s.$, II $iS = +4m.45s.$

June 9d. Readings also at 4h. (Innsbruck and La Paz), 11h. (La Paz), 17h. (Zagreb, Belgrade (2), and Moncalieri), 22h. (near Zi-ka-wei), 23h. (near Zurich).

June 10d. Readings at 4h. (Melbourne), 5h. (Taihoku), 8h. (Zagreb), 9h. (Zi-ka-wei), 11h. (Rocca di Papa), 17h. (Zi-ka-wei), 21h. (Tiflis).

June 11d. Readings at 5h. (Tiflis), 6h. (Apia), 8h. (near Puebla), 11h. and 12h. (near Taihoku), 17h. (Zi-ka-wei and near Taihoku), 20h. (Taihoku).

1922. June 12d. 4h. 47m. 40s. Epicentre $24^{\circ}0N.$ $107^{\circ}0W.$

A = -267, B = -874, C = -407; D = -956, E = -292;

G = -119, H = -389, K = -914.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mazatlan		1.0	146	-0 1	-16	—	—	0.3	0.6
Colima		6.6	152	5 38	?	—	—	6.4	7.2
Tacubaya	E.	8.4	122	2 9	- 2	4 10	+23	4.5	5.6
	N.	8.4	122	2 9	+ 2	4 6	+19	4.8	6.6
	Z.	8.4	122	2 13	+ 6	4 9	+22	4.7	6.1
Tucson		9.0	338	2 6	-10	4 15	+12	4.5	7.1
Vera Cruz		11.2	113	2 0	-47	4 20	-39	5.4	5.8
Oaxaca		11.8	124	3 8	+12	7 0	?	7.7	8.7
Merida		16.3	97	4 50	+54	8 5	?L	11.2	14.0
Lick		18.3	320	—	—	—	—	i 9.8	11.4
Berkeley	E.	19.0	320	i 4 14	-15	—	—	e 9.6	14.5
St. Louis		20.4	40	i 4 56	+10	i 8 50	+18	e 9.8	11.8
Chicago		24.0	37	5 23	- 5	9 53	+ 9	12.1	13.8
Ann Arbor		26.6	41	5 50	- 4	10 50	+17	13.6	15.2

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		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°		m. s.	s.	m. s.	s.	m.	m.
Victoria	Z.	27.6	336	6 20	+16	—	—	17.7	21.1
Georgetown	E.	29.4	52	e 6 14	-8	11 24	0	16.7	19.3
	N.	29.4	52	e 6 20	-2	11 24	0	16.4	17.1
Washington		29.4	52	6 12	-10	11 20	-4	—	17.3
Cheltenham	E.	29.4	53	—	—	11 31	-7	16.6	19.6
	N.	29.4	53	—	—	11 3	-21	14.2	17.2
Toronto		29.9	42	7 2	-35	12 8	+36	i 16.7	17.4
Balboa Heights	E.	30.2	116	7 15	+45	—	—	15.3	19.6
	N.	30.2	116	7 5	-35	13 15	+98	15.4	17.2
Ithaca		31.2	47	e 6 24	-16	11 46	-8	14.6	—
Fordham	E.	32.4	50	e 6 37	-15	e 12 8	-6	16.3	19.3
Port au Prince		32.7	93	e 6 50	-4	9 31	?	14.0	—
Ottawa		33.1	42	6 46	-11	11 19	-67	e 16.3	18.8
Northfield		34.5	45	e 5 50	-79	—	—	—	19.8
Porto Rico	E.	39.1	90	7 30	-17	13 46	-7	18.8	22.0
	N.	39.1	90	—	—	—	—	e 25.6	28.1
Honolulu	E.	47.0	277	e 9 40	+53	15 15	-26	e 24.4	26.8
	N.	47.0	277	—	—	15 10	-31	i 22.5	26.5
La Paz		55.5	133	i 9 45	+2	i 17 31	+3	i 23.5	24.7
Mendoza		67.8	146	19 2	-58	—	—	34.5	36.7
Cipolletti		72.7	149	29 26	?	—	—	45.3	47.4
Dyce	N.	77.6	32	e 11 53	-12	20 58	-58	34.6	41.3
Edinburgh		77.7	34	19 20	?S	(19 20)	-157	37.3	49.3
Bidston		78.7	36	23 13	?S	(23 13)	+65	—	48.6
Stonyhurst		78.9	36	20 32	?	27 38	?SR ₁	40.3	47.3
Oxford		80.5	38	12 34	+12	22 35	+6	34.0	47.2
Coimbra	E.	80.9	49	12 49	+25	22 49	+15	37.3	48.8
	N.	80.9	49	—	—	—	—	36.8	41.9
Kew		81.1	38	22 20	?S	(22 20)	-16	—	49.3
Rio Tiuto		83.2	51	23 20	?S	(23 20)	+21	—	53.3
De Bilt		83.7	35	12 57	+17	23 9	+3	e 38.3	52.7
Uccle		84.0	36	e 12 47	+5	23 11	+3	e 35.3	49.2
Paris		84.0	38	e 12 59	+17	i 23 12	+4	35.3	41.3
Strasbourg		84.2	37	e 13 33	+50	23 46	+36	36.7	51.8
Upsala		84.8	25	e 13 4	+17	e 23 13	-4	e 38.4	43.0
Hamburg		85.4	31	e 13 20	+30	e 23 24	+1	e 37.3	53.2
Granada		85.6	50	e 12 45	-6	i 22 12	-74	e 24.8	42.2
Tortosa	N.	86.7	46	e 13 48	+51	23 44	+6	36.8	—
Besaçon		86.8	39	e 13 19	+21	23 24?	+4	44.3	—
San Fernando		87.0	52	12 56	-3	—	—	43.1	52.7
Barcelona		87.4	44	e 18 20	?PR ₁	e 23 46	+1	e 42.6	44.7
Moncalieri		89.0	40	e 13 53	+43	i 24 4	+1	40.6	51.3
Konigsberg		89.3	27	e 15 1	?	—	—	e 38.6	50.3
Innsbruck		89.8	36	—	—	—	—	e 35.8	45.3
Algiers		90.5	48	e 13 12	-7	e 24 5	-14	41.3	45.8
Padova		91.2	38	17 12	?	24 12	-14	43.8	55.3
Vienna		91.8	33	e 13 22	-4	23 43	-50	e 38.3	50.2
Zagreb		93.2	36	e 13 28	-5	e 24 20	-27	e 37.3	46.7
Rocca di Papa		93.8	40	—	—	i 25 14	+20	e 43.4	45.1
Lemberg		94.4	29	e 21 2	?	e 31 2	?	e 42.0	50.8
Pompeii		95.5	40	—	—	—	—	58.3	—
Belgrade		96.2	34	e 13 3	-47	24 19	-59	e 40.9	54.8
Zi-ka-wei		107.9	317	e 18 36	?PR ₁	e 27 54	+45	—	70.9
Sydney		112.4	241	50 20	?L	—	—	(50.3?)	56.1
Melbourne		118.2	239	—	—	e 29 38	+62	e 53.3	68.6
Manila		119.3	305	e 21 20	?PR ₁	—	—	—	—
Simla	E.	124.7	356	e 57 32	?L	—	—	e 63.9	—
	N.	124.7	356	e 57 50	?L	—	—	e 63.6	—
Batavia	E.	143.0	293	i 21 36	?PR ₁	—	—	—	—
Kodaikanal		145.5	353	86 26	?L	—	—	(86.4)	—

Additional readings: Tucson LN = +4.9m., MN = +6.0m., T₀ = 4h.47m.88.
 Lick iE = +14m.17s. Berkeley MN = +15.1m. Ann Arbor MN =
 +16.2m., T₀ = 4h.47m.18s. Georgetown iE = +14m.3s. Cheltenham
 SR₁E = +13m.1s., SR₁N = +12m.16s., LN = -15.9m., T₀ = 4h.47m.14s.
 Toronto eL = +34.8m. and +54.1m. Porto Rico PR₁E = +9m.4s.,
 PR₁N = +8m.53s., iE = 20.4m., T₀ = 4h.47m.15s. Honolulu SR₁N =
 +18m.28s., iSR₁E? = +20m.15s., T₀ = 4h.47m.30s. Bidston S =
 28m.23s. Dyce i = 25m.58s. De Bilt MN = +50.6m. Uccle
 SR₁ = 28m.38s., MN = 40.7m. San Fernando MN = +51.5m.
 Strasbourg MN = +45.3m., MZ = +51.7m. Hamburg MN = +51.2m.
 Granada iP = +13m.7s., i = +13m.48s., and +23m.49s., PS = +24m.20s.
 Barcelona MN = +56.2m. Moncalieri MN = +47.2m. Konigsberg
 MN = 48.8m. Padova PR₁ = 17m.50s., SR₁ = +24m.50s. Vienna
 PR₂ = +18m.38s., PS = +24m.47s., MN = +52.0m. Zagreb MNW =
 +55.9m. Belgrade L = +51.0m., LM = +50.0m.

June 12d. 10h. 42m. 20s. Epicentre 19° 5' N. 109° 40' W.

A = -307, B = -891, C = +334; D = -946, E = +326;
G = -109, H = -316, K = -942.

		Δ	Az.	P.	O-C.	S	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Mazatlan	E.Z.	4.4	34	—	—	—	—	2.1	3.2
Colima		5.3	105	1 28	-6	—	—	2.4	2.8
Tacubaya	E.	9.2	99	2 6	-13	3 54	-14	4.4	5.5
	N.Z.	9.2	99	2 6	-13	3 54	-14	4.5	5.6
Oaxaca		11.9	100	2 52	-6	5 31	+14	6.4	6.9
	Z.	11.9	100	—	—	—	—	6.3	6.8
Vera Cruz		12.1	90	2 20	-40	—	—	6.0	8.2
Tucson	E.	12.9	353	—	—	6 26	+44	7.0	8.8
	N.	12.9	353	3 34	+22	—	—	7.6	9.4
Merida		18.2	82	5 4	-45	8 19	+35	11.5	14.5
St. Louis		25.1	37	e 5 40	+1	e 10 0	-5	11.2	14.4
Chicago		28.7	35	6 13	-2	10 45	-27	12.9	16.0
Victoria	Z.	31.1	342	—	—	—	—	19.7	22.4
Ann Arbor		31.2	38	e 6 52	+12	—	—	16.7	—
Georgetown		33.7	49	e 6 56	-6	e 12 19	-17	e 18.7	—
Washington		33.7	49	7 32	+30	12 6	-30	—	—
Cheltenham	N.	33.7	50	—	—	e 14 59	+143	17.9	19.1
Toronto		34.6	40	8 10	+60	(e 12 46)	3	19.3	19.8
Ithaca		35.7	44	e 7 40	+21	e 12 40	-26	19.3	—
Fordham	N.	36.7	48	12 57	18	(12 57)	-23	19.7	—
Ottawa		37.7	40	e 7 16	-20	i 13 17	-17	e 19.7	—
Northfield		39.0	43	—	—	—	—	e 16.7	—
Honolulu	E.	45.8	281	—	—	e 15 37	+12	21.5	23.4
	N.	45.8	281	—	—	e 15 50	+25	21.8	22.8
La Paz		53.9	130	i 9 34	+2	17 12	+4	—	28.0
Mendoza		65.2	143	20 34	18	(20 34)	+67	33.7	36.1
Cipolletti		69.9	147	41 40	?	—	—	42.8	45.9
Edinburgh		82.4	34	—	—	22 40	-10	—	48.7
Bidston		83.4	36	21 18	?	24 3	+62	—	47.7
Oxford		85.1	37	—	—	i 23 8	-2	—	52.2
Coimbra		85.2	49	e 13 8	+19	23 8	-13	39.7	—
De Bilt		88.5	35	—	—	e 24 0	+2	e 41.7	55.1
Uccle		88.7	35	—	—	e 24 2	+2	e 41.7	—
Paris		88.8	37	—	—	e 23 58	-3	39.7	53.7
Granada		89.9	50	i 13 15	0	i 24 31	+18	—	50.9
Hamburg		90.2	31	—	—	e 23 40	-36	e 41.7	52.7
Tortosa	N.	91.2	44	—	—	—	—	e 39.7	47.2
Strasbourg		91.7	36	12 40	-45	24 23	-9	49.7	—
Barcelona		92.0	43	—	—	—	—	e 50.1	—
Moncalieri		93.7	39	e 11 47	-109	24 25	-28	45.5	—
Konigsberg		94.1	26	—	—	—	—	e 52.6	53.7
Zagreb		97.9	35	—	—	e 23 40	-115	e 45.7	56.7
Zi-ka-wei	Z.	109.9	315	19 28	1PR ₁	e 29 12	+105	—	60.7
Melbourne		114.2	236	—	—	e 29 40	+96	e 53.0	64.2

Additional readings and notes: Colima readings are diminished by 4m. Tacubaya readings have been increased by 1h. Oaxaca readings have been increased by 2h. Vera Cruz gives also MN = +8.1m. Tucson gives also e = +4m.54s. Victoria readings have been increased by 1h. Georgetown eN = +6m.57s., eLN = +18.0m. Cheltenham eE = +22m.9s. Ithaca eN = +15m.10s. Fordham PE = +13m.2s., all readings diminished by 1h. Ottawa i = +17m.44s. Honolulu eE = +20m.20s., eN = +19m.58s. Coimbra eLN = +38.7m. De Bilt MN = +55.9m. Granada i = +17m.5s. and +24m.18s. (18S). Hamburg MN = +56.7m. Zagreb MNW = +59.7m.

June 12d. Readings also at 2h. (Mizusawa), 3h. (Mizusawa (2) and Ootomari), 5h. (La Paz and Budapest), 6h. (Moncalieri and near Lick), 7h. (Melbourne), 8h. (near Belgrade), 9h. (Rocca di Papa), 12h. (Riverview and Manila), 13h. (La Paz), 14h. (Riverview), 15h. (Melbourne, De Bilt, and Moncalieri), 16h. (Innsbruck), 21h. (Strasbourg and Zurich), 22h. (Nagasaki).

June 13d. Readings at 0h. (Zagreb and near Zurich), 3h. (near Lick and near Merida), 4h. (Zi-ka-wei), 5h. (De Bilt), 6h. (near Taihoku), 7h. (Coimbra), 10h. (Nagoya), 16h. (near Nagasaki), 21h. (Zagreb).

June 14d. Readings at 3h. (La Paz), 6h. (near Coimbra (2)).

June 15d. Readings at 7h. (near Tokyo), 8h. (near Rocca di Papa), 15h. (Chicago, Zagreb, and near Belgrade), 19h. (near Tokyo), 20h. (Zagreb and Sinj).

June 16d. 5h. 47m. 8s. Epicentre $39^{\circ}0'N$. $23^{\circ}0'E$. (as on 1918 Feb. 11d.).

A = +.715, B = +.304, C = +.629 ; D = +.391, E = -.920 ;
G = +.579, H = +.246, K = -.777.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	1.2	151	e 0 17	- 1	—	—	0.8	1.0
Belgrade	6.1	342	e 1 34	+ 1	e 2 22	-24	—	3.2
Rocca di Papa	8.4	294	e 1 34	-33	—	—	—	4.1
Zagreb	8.5	325	—	—	e 3 52	+ 2	—	—

Additional readings : Athens gives also MN = +1.2m. Rocca di Papa
ePN = +1m.28s. Zagreb L = 6h.28m.

June 16d. 20h. 59m. 40s. Epicentre $30^{\circ}0'N$. $114^{\circ}0'W$. (as on 1921 June 17d.).

A = -.352, B = -.791, C = +.500 ; D = -.914, E = +.407 ;
G = -.203, H = -.457, K = -.866.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tucson	E. 3.5	50	0 36	-19	—	—	1.9	2.1
	N. 3.5	50	0 46	- 9	1 14	-23	1.5	1.7
Lick	E. 9.7	322	i 3 18	+52	i 4 36	+15	—	5.0
Victoria	19.7	342	6 41	?	—	—	7.8	11.0
St. Louis	21.4	60	i 4 32	-26	9 20	+27	10.8	—
Ann Arbor	27.2	55	—	—	e 10 26	-19	14.0	15.0
Toronto	30.6	52	—	—	(11 44)	0	11.7	17.4
Georgetown	31.5	63	—	—	e 12 57	+57	(16.1)	—
Washington	31.5	63	—	—	e 12 6	+ 6	16.8	—
Cheltenham	N. 31.6	63	—	—	12 11	+10	16.3	17.8
Ithaca	32.4	58	—	—	e 13 20	+66	e 16.3	—
Ottawa	33.5	52	—	—	e 11 27	-65	e 16.3	17.3
Fordham	34.1	61	—	—	e 15 56	?SR ₁	17.3	—
Northfield	35.4	55	—	—	—	—	e 17.3	—
Honolulu	E. 40.4	268	—	—	e 16 38	?SR ₁	e 18.0	21.9
	N. 40.4	268	6 40	-78	—	—	e 16.8	21.4
De Bilt	82.2	33	—	—	—	—	e 40.3	48.9
Uccle	82.6	34	—	—	—	—	—	41.3
Strasbourg	85.8	35	—	—	—	—	e 42.3	—

Additional readings and notes : Lick iE = +3m.36s. and +4m.1s. Ann Arbor
i = +13m.44s. Toronto readings have been increased by 5h. Cheltenham
L = +16.9m. Ottawa i = +14m.20s. De Bilt MN = +56.0m.

June 16d. Readings also at 10h. (near Algiers), 11h. (Ottawa), 12h. (Batavia, Colombo, Kodaikanal, Ottawa, Georgetown, and Ann Arbor), 20h. (Porto Rico).

June 17d. 2h. 34m. 0s. Epicentre $0^{\circ}5'N$. $130^{\circ}0'E$.

A = -.643, B = +.766, C = +.009 ; D = +.766, E = +.643 ;
G = -.006, H = +.007, K = -1.000.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	16.7	328	e 4 0	- 1	(6 48)	-23	6.8	—
Batavia	24.1	253	i 5 28	- 1	i 9 47	+ 1	—	—
Taihoku	25.8	342	—	—	e 11 0	+42	11.1	11.1
Zi-ka-wei	31.7	346	e 6 13	- 1	—	—	—	—
Riverview	39.7	152	—	—	e 25 0	?	e 27.5	e 28.2
De Bilt	110.1	328	—	—	—	—	e 56.0	—
Strasbourg	110.3	323	—	—	—	—	81.0	—
Uccle	111.2	327	—	—	—	—	e 58.0	—

Additional readings and notes : Batavia gives also iE = +7m.7s., T₀ =
2h.34m.11s. Epicentre $2^{\circ}4'N$. $129^{\circ}3'E$. Taihoku readings are diminished
by 10m.

June 17d. Readings also at 5h. (Colombo, Kodaikanal, and near Athens (2)), 6h. (near Athens), 8h. (Rocca di Papa, Zagreb, and Pompeii), 9h. (Zagreb), 12h. (near Manila), 14h. (Tiflis), 16h. (Pompeii, Zagreb, and Rocca di Papa), 23h. (Zagreb and near Tucson).

June 18d. 12h. 14m. 25s. (I) † Epicentre 36° 1'N. 137° 3'E. (as on 1922 May 4d.).
12h. 17m. 20s. (II) †

A = -594, B = -548, C = -598; D = -678, E = -735;

G = -433, H = -400, K = -808.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Nagoya	1-0	196	0 16	+ 1	—	—	—	—
II	1-0	196	—	—	(0 22)	- 6	0-4	0-9
II Tokyo	2-0	100	0 39	+ 8	—	—	e 1-3	1-8
I Osaka	2-1	218	0 37	- 4	(0 57)	- 1	1-0	1-2
II	2-1	218	0 31	- 2	(0 53)	- 5	0-9	1-2
I Kobe	2-2	231	0 35	+ 1	(0 58)	- 2	1-0	1-0
II	2-2	231	0 29	- 5	(0 57)	- 3	1-0	1-0
II Mizusawa	4-3	45	1 27	+20	3 2	?L	(3-0)	—
II Zi-ka-wei	14-1	254	—	—	e 5 48	-22	—	9-1
II Manila	26-0	218	e 9 11	?S	(e 9 11)	71	—	—
II De Bilt	82-5	332	—	—	—	—	e 49-7	55-9
II La Paz	150-1	56	20 7	[+11]	—	—	—	—

Additional readings: Osaka gives also MN = +1-1 (both shocks). Mizusawa
II PN = +1m.29s. De Bilt II MN = +52-7m.

June 18d. Readings also at 6h. (Coimbra), 7h. (Pompeii, Rocca di Papa, and Zagreb), 12h. (near Tokyo), 15h. (Tiflis), 17h. (Granada), 18h. (near Belgrade, Zagreb, and Athens), 19h. (near Helwan), 20h. (Zagreb and near Belgrade), 21h. (Zagreb, Zante, and near Athens), 22h. (Riverview).

June 19d. 0h. 39m. 12s. Epicentre 40° 5'N. 26° 0'E. (as on 1917 Dec. 27d.).

A = +683, B = +333, C = +649; D = +438, E = -899;

G = +584, H = +285, K = -760.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3-1	214	e 0 55	+ 6	—	—	1-6	2-2
Belgrade	5-9	319	e 1 57	+26	i 4 24	?	—	4-8
Zante	6-4	246	—	—	—	—	3-8	—
Zagreb	9-0	309	e 4 6	?S	(e 4 6)	+ 3	i 5-3	7-5
Vienna	10-3	322	—	—	e 4 30	- 7	—	7-8
Moncalieri	14-1	295	—	—	e 7 18	?L	10-2	—
Tiflis	14-2	79	e 12 24	?	—	—	—	—
Uccle	18-2	312	—	—	—	—	e 9-8	—
De Bilt	18-4	316	—	—	e 7 42	- 7	e 9-9	—

Additional readings: Athens gives also MN = +2-8m. Zagreb MNW = +6-0m.

June 19d. Readings also at 4h. (La Paz), 14h. (Zante, Zagreb, and near Athens), 15h. (De Bilt), 23h. (Manila).

June 20d. 8h. 46m. 45s. Epicentre $32^{\circ}0'N$. $126^{\circ}0'E$.

A = -498, B = -686, C = +530.

Very rough.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Nagasaki	3.3	0 43	- 9	—	—	1.3	1.7
Zi-ka-wei	4.0	—	—	e 1 52	+ 2	—	5.6
Kobe	8.1	e 2 36	+33	—	—	—	—
Osaka	8.3	2 11	+ 5	—	—	—	6.2
De Bilt	81.3	—	—	—	—	e 46.2	—

June 20d. 9h. 43m. 6s. Epicentre $13^{\circ}0'N$. $120^{\circ}0'W$.A = -487, B = -844, C = +225; D = -866, E = +500;
G = -113, H = -195, K = -974.

Very rough.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz	59.1	120	i 10 6	0	18 13	+ 1	29.0	31.4
Mendoza	67.3	136	11 48	+48	(21 42)	+108	21.7	22.8
Pilar	E. 69.9	133	11 12	- 4	—	—	22.6	26.6
	N. 69.9	133	11 12	- 4	—	—	24.2	28.2
Cipolletti	71.0	140	21 24	?S	(21 24)	+46	25.9	32.9
Riverview	96.3	236	—	—	—	—	e 49.4	—
Coimbra	97.3	46	—	—	—	—	e 53.9	—
De Bilt	E. 99.6	31	—	—	e 48 24	?L	e 60.9	62.7
	N. 99.6	31	—	—	—	—	e 61.9	65.6
Zi-ka-wei	Z. 106.4	310	e 21 23	?PR ₁	—	—	—	85.3

No additional readings.

June 20d. Readings also at 1h. (near Mizusawa), 6h. (Kodaikanal), 15h. (near Apia and Riverview), 21h. (near Zurich), 22h. (Zagreb), 23h. (near Algiers and near Mostar).

June 21d. Readings at 6h. (Zi-ka-wei and Riverview), 7h. (Melbourne), 9h. (near Mostar), 10h. (Zagreb), 12h. (near Tacubaya), 13h. (Zi-ka-wei, Honolulu, and near Tokyo and Mizusawa).

June 22d. 23h. 15m. 15s. Epicentre $37^{\circ}5'N$. $19^{\circ}7'E$. (as on 1918 July 9d.).A = +747, B = +267, C = +609; D = +337, E = -941;
G = +573, H = +205, K = -793.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	3.2	81	e 0 49	- 1	e 1 30	+ 2	i 1.6	2.0
Rocca di Papa	6.8	311	e 1 40	- 4	—	—	(e 3.4)	4.8
Belgrade	7.3	4	e 3 32	?S	(e 3 32)	+14	(e 4.9)	6.2
Zagreb	8.8	341	e 3 39	?S	(e 3 39)	-19	e 4.8	5.0
Vienna	11.0	348	e 1 27	?S	(e 4 27)	-27	—	8.2
Strasbourg	14.1	326	e 8 2	?L	—	—	(e 8.0)	—
Uccle	17.2	325	—	—	—	—	e 9.8	—
Konigsberg	17.3	2	—	—	e 8 25	+60	—	16.8
De Bilt	17.8	329	—	—	e 7 39	+ 3	e 10.2	—

Additional readings: Athens gives also SN = +1m.32s., MN = +2.6m., T₁ = 23h.15m.11s. Rocca di Papa eN = +2m.4s., SN = +4m.18s., SE = +4m.28s. Zagreb MNW = +6.0m. Strasbourg e = +9m.0s.

June 22d. Readings also at 0h. (De Bilt, Zi-ka-wei, and near Taihoku), 2h. (near Mizusawa), 10h. (Berkeley and near Tokyo), 12h. (Belgrade), 13h. (near Manila), 15h. (near Tokyo), 16h. (Zi-ka-wei and near Taihoku (3)), 17h. (near Taihoku), 19h. (near Mizusawa and Tokyo), 20h. (Zi-ka-wei, Vienna, Apia, Honolulu, Strasbourg, and Zagreb), 21h. (Uccle, De Bilt, Strasbourg, and near Berkeley).

June 23d. Readings at 0h. (Zagreb), 1h. (Nagoya and near Tokyo), 4h. (Taihoku), 8h. (near Oaxaca), 10h. (Malaga), 12h. (Paris), 15h. (near Mizusawa), 16h. (Merida and Tiflis), 17h. (Zagreb), 20h. (near Taihoku).

June 24d. 16h. 27m. 35s. Epicentre $6^{\circ}3'N$, $123^{\circ}2'E$. (as on 1919 Sept. 26d.).

$$A = -.544, B = -.832, C = +.110; \quad D = +.837, E = -.548; \\ G = -.060, H = +.092, K = -.994.$$

		\angle	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila		8.6	346	e 2 16	- 6	4 3	+10	4.5	6.0
Hong Kong		18.4	332	4 15	- 7	(7 45)	- 4	7.8	—
Batavia		20.6	233	4 43	- 5	i 8 43	- 7	—	—
Zi-ka-wei	z.	25.0	356	6 32	+54	e 10 54	-51	—	15.7
Colombo		43.0	273	8 25	+7	18 25	?SR ₁	28.4	30.4
Vienna	z.	96.3	321	e 17 30	?PR ₁	—	—	57.4	—
Zagreb		97.2	318	e 13 25	-30	—	—	50.4	—
Strasbourg		101.5	321	—	—	—	—	57.4	—
De Bilt	E.	101.6	325	—	—	—	—	e 54.4	59.7
	N.	101.6	325	—	—	—	—	e 53.4	57.3
Eskdalemuir		104.2	332	—	—	—	—	56.4	—
La Paz		165.0	134	20 15	[- 3]	—	—	—	—

Additional readings: Manila gives MN = +5.0m. De Bilt gives epicentre $5^{\circ}8'N$, $123^{\circ}3'E$.

June 24d. Readings also at 1h. (Zagreb), 7h. (Taihoku), 10h. (Mizusawa and Lemberg), 12h. (Mizusawa), 18h. (Manila), 21h. (Christchurch and Riverview), 22h. (Manila, Vienna, and Zi-ka-wei), 23h. (Manila).

June 25d. 18h. 41m. 16s. Epicentre $36^{\circ}0'N$, $141^{\circ}0'E$. (as on 1921 Nov. 29d.).

$$A = -.629, B = +.509, C = +.588; \quad D = +.629, E = +.777; \\ G = -.457, H = +.370, K = -.809.$$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo		1.1	253	i 0 20	- 3	i 0 27	- 4	i 0.5	0.5
Mizusawa	E.	3.1	1	0 48	- 1	1 29	- 3	—	—
Nagoya		3.4	256	0 41	-12	—	—	—	—
Osaka		4.7	256	1 16	- 3	(2 6)	- 3	2.1	2.7

Additional readings: Mizusawa gives also PN = -50s. Nagoya reading is increased by 1m.

June 25d. Readings also at 6h. (near Mizusawa), 8h. (near Merida), 11h. (La Paz, Paris, and near Balboa Heights), 12h. (Bidston), 13h. (Paris and Rocca di Papa), 15h. (Barcelona (2)), 16h. (Batavia and Algiers), 19h. (Port au Prince).

June 26d. Readings at 12h. (Batavia), 15h. (near Taihoku), 18h. (near Merida), 19h. (Manila), 21h. (Manila (2) and Port au Prince).

1922. June 27d. 14h. 29m. 55s. Epicentre 6°·5N. 126°·0E.

(as on 1921 Nov. 7d.).

A = -·584, B = +·804, C = +·113 ; D = +·809, E = +·588 ;

G = -·066, H = +·092, K = -·994.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	9·5	330	e 2 19	- 4	5 15	?L	6·2	8·4
Taihoku	19·0	347	e 4 32	+ 3	(7 49)	-13	7·8	—
Hong Kong	19·5	326	e 4 23	-12	8 9	- 4	10·0	—
Batavia	22·9	237	i 5 14	- 2	9 31	+ 8	—	—
Zi-ka-wei	25·0	351	5 49	+ 11	e 10 11	- 8	—	16·3
Kobe	29·4	15	e 6 7	-15	—	—	14·7	17·0
Osaka	29·5	16	6 28	+ 5	—	—	—	18·0
Tokyo	31·8	21	e 6 43	- 2	e 13 15	+70	e 17·6	—
Calcutta	39·7	299	6 40	-72	—	—	16·7	—
Colombo	45·9	273	9 35	+56	—	—	16·1	17·1
Riverview	46·8	151	e 8 17	-29	e 15 33	- 5	e 22·3	—
Sydney	46·9	151	8 47	+ 1	—	—	25·1	30·1
Melbourne	47·7	160	—	—	e 13 23	-147	21·6	32·8
Kodaikanal	48·2	278	9 23	+28	—	—	28·8	32·9
Simla	E. 51·8	308	—	—	e 16 23	-18	—	—
Honolulu	74·7	69	11 25	-22	e 21 50	+28	36·1	45·4
Tiflis	79·1	313	e 11 59	-15	e 21 41	-32	e 42·1	54·6
Konigsberg	93·4	326	i 19 30	?PR ₁	23 37	-72	e 52·1	60·6
Belgrade	96·3	317	e 13 8	-43	i 27 52	+153	—	—
Victoria	98·6	40	—	—	26 23	+41	47·6	50·8
Zagreb	99·0	318	e 13 35	-30	e 24 17	-89	e 51·1	66·1
Hamburg	99·7	327	—	—	e 21 5	? e 55·1	61·1	—
Innsbruck	101·4	321	—	—	22 35	? e 53·6	—	—
Strasbourg	102·4	321	e 13 56	-26	25 49	-30	e 55·1	62·1
Rocca di Papa	102·6	315	e 23 29	?	—	—	55·3	—
Berkeley	102·8	49	e 17 59	?PR ₁	—	—	—	—
De Bilt	102·9	327	—	—	—	—	e 55·1	64·4
Uccle	104·0	326	—	—	—	—	e 51·1	68·1
Moncalieri	104·6	320	e 11 14	?	24 38	-120	45·6	—
Edinburgh	105·0	333	—	—	—	—	57·1	67·1
Eskdalemuir	105·4	333	—	—	i 26 3	-43	54·1	66·8
Stonyhurst	105·9	331	e 18 35	?PR ₁	—	—	—	69·9
Paris	106·1	324	—	—	e 28 5	+72	58·1	66·1
Kew	106·1	328	—	—	—	—	—	69·1
Bidston	106·4	331	47 15?	?	53 52?	?L (53·9?)	69·1	—
Oxford	106·4	328	—	—	—	—	—	66·1
Tortosa	N. 111·2	319	—	—	—	—	57·1	70·4
Coimbra	117·4	322	26 35	?S	(26 35)	-114	e 61·1	—
Chicago	122·8	29	20 24	?PR ₁	30 5	+55	63·1	—
Ann Arbor	124·2	25	e 18 53	?PR ₁	(26 47)	-153	26·8	—
Ottawa	124·7	18	i 20 35	?PR ₁	e 30 45	+81	e 57·6	—
Toronto	124·9	20	i 22 23	?PR ₁	i 29 11	-14	71·7	—
Georgetown	N. 129·8	21	—	—	e 30 37	?	52·1	—
Washington	129·8	21	e 22 10	?PR ₁	—	—	—	—
La Paz	162·9	127	e 20 5	[- 5]	34 8	?	78·4	81·8

Additional readings : Manila gives also MN = +8·6m. Batavia i = +7m.6s.
 Zi-ka-wei PSN = +10m.20s., PSZ = +10m.21s., PSE = +10m.44s., SR₁N =
 +11m.50s., SR₁Z = +11m.55s., MZ = +16·5m. Osaka MN = +24·2m.
 Honolulu SE = +20m.50s., LE = +33·6m., T₀ = 14h.29m.54s. Tiflis
 e?? = +41·7m. De Bilt MN = +53·5m. Konigsberg MN = +64·1m. Belgrade
 PR₁ = +18m.54s. Zagreb MNW = +54·1m. Victoria +31m.35s.,
 L? = +41·7m. Uccle MN = +57·8m. Epicentre 3·2N. 128·0E.
 Strasbourg MN = +71·1m. Eskdalemuir e =
 +24m.43s. Paris MN = +59·1m. Tortosa readings have been increased
 by 3h. Ottawa L = +69·1m. Toronto e = +32m.29s.

June 27d. Readings also at 1h. (Algiers), 13h. (La Paz, Riverview, and Kodaikanal), 14h. (Kodaikanal), 17h. (near Tacubaya), 18h. (near Athens).

June 28d. Readings at 0h. (Colombo, Riverview, Zi-ka-wei, and La Paz), 1h. (Kodaikanal), 10h. (Almeria, Malaga, and near Granada), 18h. (Zi-ka-wei and La Paz), 19h. (Colombo), 20h. and 21h. (3) (near Tacubaya)

June 29d. 4h. 49m. 57s. Epicentre $31^{\circ}5'N$, $141^{\circ}5'E$.

A = -0.667, B = +0.531, C = +0.522; D = +0.623, E = +0.783;

G = -0.409, H = +0.325, K = -0.853.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tokyo		4.4	342	11 13	+ 5			e 5.5	—
Nagoya		5.3	315	2 32	?S	(2 32)	7	—	—
Osaka		6.0	304	1 46	+14	—	—	3.9	7.4
Kobe		6.2	303	e 2 49	?S	(e 2 49)	0	e 4.4	—
Mizusawa	E.	7.7	358	1 57	0	3.28	- 1	—	—
	N.	7.7	358	1 56	- 1	3.29	0	—	—
Nagasaki		9.9	281	6 23	?L	—	—	(6.4)	—
Zi-ka-wei	Z.	17.1	274	4 3	3	e 7 19	- 1	—	11.5
Manila		25.2	233	e 4 45	-5.5	—	—	—	—
De Bilt	N.	88.1	335	—	—	—	—	e 50.0	58.4
Uccle		89.4	335	—	—	—	—	e 48.0	—
Strasbourg		89.9	332	—	—	—	—	e 53.3	—
La Paz		149.2	68	19 40	[-14]	—	—	—	—

Additional readings: Osaka gives also MN = +7.2m. De Bilt eLE = +49.0m.

June 29d. 10h. 30m. 20s. (i) Epicentre $37^{\circ}5'N$, $19^{\circ}7'E$. (as on June 22d.).
17h. 10m. 15s. (ii)

A = +0.747, B = +0.267, C = +0.609; D = +0.337, E = -0.941;

G = +0.573, H = +0.205, K = -0.793.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
i Athens		3.2	81	e 0 56	+ 6	e 1 34	+ 6	1.6	2.3
ii		3.2	81	e 0 26	-24	—	—	1.1	1.2
i Pompeii		5.2	310	e 2 15	?S	(e 2 15)	- 7	—	—
i Rocca di Papa	E.	6.8	311	e 1 41	- 3	e 4 16	?L	(e 4.3)	—
ii		6.8	311	e 1 39	5	e 4 3	?L	(e 4.0)	4.2
i Belgrade		7.3	1	e 2 23	+32	e 3 52	?L	(e 5.2)	—
ii		7.3	1	e 4 49	2	e 3 47	?L	(e 3.8)	4.7
i Zagreb		8.8	341	e 2 10	3	e 3 57	- 1	—	5.6
ii		8.8	341	e 2 15	+ 2	—	—	e 4.8	5.2
i Strasbourg		14.1	326	—	—	—	—	e 8.0	—
ii		14.1	326	—	—	—	—	e 8.0	—
i Hamburg		17.4	340	—	—	—	—	e 10.7	—
i De Bilt		17.8	329	—	—	—	—	e 10.7	—
ii		17.8	329	—	—	—	—	e 10.8	—

Additional readings: Athens (i) gives also MN = +2.0m. Athens (ii) MN = +1.6m. Rocca di Papa (i) cPN = +1m.40s., cSN = +4m.10s., N = +4m.19s., E = +4m.32s. Rocca di Papa (ii) cSN = +3m.51s. Belgrade (i) SR₁ = 4m.19s., L = 7.4m. Zagreb (i) MNW = +8.2m. Zagreb (ii) MNW = +6.6m. Strasbourg (i) e = +8m.40s. Strasbourg (ii) reading has been diminished by 1h. Tifis (i) (Δ = 19.7) gives e = 10h.26m.42s.

June 29d. 20h. 54m. 50s. Epicentre $18^{\circ} \cdot 8' \text{N}$. $120^{\circ} \cdot 0' \text{E}$.

$$A = -\cdot 473, B = +\cdot 820, C = +\cdot 322; \quad D = +\cdot 866, E = +\cdot 500; \\ G = -\cdot 161, H = +\cdot 279, K = -\cdot 947.$$

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Manila		4.3	167	e 1 5	- 2	—	—	2.4	2.6
Hong Kong		6.5	304	1 41	+ 2	3 0	+ 3	3.5	4.7
Zi-ka-wei	Z.	12.5	6	3 5	- 1	—	—	—	8.8
De Bilt	E.	89.4	326	—	—	—	—	e 46.2	57.6
	N.	89.4	326	—	—	—	—	e 45.2	48.3
Uccle		90.5	325	—	—	—	—	e 44.2	—

Manila gives also $MN = +2.5\text{m}$.

June 29d. Readings also at 7h. (Manila), 8h. (Belgrade and near Athens), 10h. (near Belgrade (2) and near Granada), 14h. (near Tacubaya), 16h. (La Paz), 22h. (near Algiers).

June 30d. Readings at 5h. (Colombo), 7h. (Taihoku), 13h. (near Mizusawa), 16h. (Tiflis, Zagreb, and near Florence and Rocca di Papa), 18h. (near La Paz), 19h. (La Paz and Rio Tinto), 20h. (near Algiers), 21h. (Tiflis), 22h. (Rio Tinto).

Diurnal Period in Italian Earthquakes.

Mr. R. D. Oldham, F.R.S., allows us to print the results of his harmonic analysis of the summary of 10 years' Italian earthquakes, 1911-1920, together with similar results for two previous decades, as follows :—

1891-1900	$1.00 + .25 \sin (t - 63^\circ) + .14 \sin (2t + 14^\circ)$
1901-1910	$1.00 + .29 \sin (t + 58^\circ) + .12 \sin (2t + 19^\circ)$
1911-1920	$1.00 + .27 \sin (t + 37^\circ) + .15 \sin (2t + 17^\circ)$

The advance of 26° in the maximum for the first harmonic is noteworthy.

Belated Readings.

WELLINGTON, N.Z.

The following readings were received too late for insertion in the text :—

Date.	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
d. h. m.	c		m. s.	s.	m. s.	s.	m.	m.
Apr. 25 21 19	29.1	167	—	—	e 11 6	-13	(i 14.6)	15.2
Apr. 25 21 39	29.1	167	—	—	—	—	14.5	15.0
Apr. 26 1 11	82.9	154	—	—	e 28 53	?SR ₁	e 39.3	42.1
Apr. 26 3 59	88.7	164	—	—	e 24 6	+ 6	e 44.7	45.0
Apr. 28 6 38	2.8	264	-0 6	50	—	—	i 1.9	4.4
May 1 10 51	79.4	156	—	—	—	—	e 64.6	65.8
May 11 9 14	19.7	169	—	—	i 8 17	0	9.3	10.3
May 12 18 39	19.7	169	e 4 40	+ 3	i 8 22	+ 5	9.2	10.5
June 2 20 11	65.3	143	—	—	e 19 55	+26	e 32.2	37.4

Readings also on April 26d. at 5h., 6h., 11h., 12h., and 16h. (2); on May 28d. 0h. and 4h.; and on June 9d. 20h.

The only case calling for special remark is that of April 28d. 6h. 38m., where the information is generally rough, and the Wellington observation of P (unless it is in error by 1m.) suggests that T₀ should be sensibly earlier. But it seems clear that the observations cannot be all correct, though by no means clear which of them is in error.

TABLE.

De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.
1	15	28	13	51	553	991	438	101	855	1565	710
2	31	55	24	52	560	1004	444	102	860	1575	715
3	47	83	36	53	566	1016	450	103	865	1584	719
4	62	110	48	54	573	1029	456	104	870	1593	723
5	77	137	60	55	579	1041	462	105	874	1602	728
6	92	164	72	56	586	1054	468	106	879	1612	733
7	106	190	84	57	592	1066	474	107	884	1621	737
8	121	217	96	58	599	1079	480	108	888	1630	742
9	136	243	107	59	605	1091	486	109	893	1639	746
10	150	269	119	60	612	1103	491	110	897	1648	751
11	164	294	130	61	619	1116	497	111	902	1657	755
12	179	319	140	62	625	1128	503	112	907	1666	759
13	193	344	151	63	632	1141	509	113	911	1674	763
14	206	368	162	64	638	1153	515	114	916	1682	766
15	219	392	173	65	645	1165	520	115	920	1690	770
16	232	415	183	66	651	1177	526	116	925	1698	773
17	245	438	193	67	658	1190	532	117	929	1706	777
18	257	460	203	68	664	1202	538	118	934	1714	780
19	269	482	213	69	671	1214	543	119	938	1722	784
20	281	503	222	70	677	1226	549	120	942	1729	787
21	293	524	231	71	683	1238	555	121	947	1737	790
22	305	545	240	72	690	1250	560	122	952	1744	792
23	317	565	248	73	696	1262	566	123	957	1752	795
24	328	584	256	74	702	1274	572	124	961	1759	798
25	338	603	265	75	709	1286	577	125	966	1766	800
26	348	622	274	76	715	1297	582	126	970	1773	803
27	358	641	283	77	721	1309	588	127	974	1780	806
28	368	659	291	78	727	1320	593	128	978	1787	809
29	378	677	299	79	733	1332	599	129	983	1794	811
30	388	694	306	80	739	1343	604	130	988	1801	813
31	398	711	313	81	745	1355	610	131	992	1807	815
32	407	728	321	82	750	1366	616	132	996	1814	818
33	416	744	328	83	756	1377	621	133	1001	1821	820
34	425	760	335	84	762	1388	626	134	1005	1827	822
35	433	775	342	85	768	1399	631	135	1009	1833	824
36	442	790	348	86	773	1410	637	136	1014	1840	826
37	450	804	354	87	779	1421	642	137	1018	1846	828
38	458	818	360	88	785	1432	647	138	1023	1852	829
39	466	832	366	89	790	1443	653	139	1027	1858	831
40	475	847	372	90	796	1454	658	140	1031	1864	833
41	483	861	378	91	801	1464	663	141	1035	1869	834
42	491	875	384	92	807	1475	668	142	1039	1875	836
43	498	888	390	93	812	1485	673	143	1043	1881	838
44	506	902	396	94	818	1496	678	144	1047	1886	839
45	513	915	402	95	823	1506	683	145	1051	1892	841
46	520	928	408	96	829	1516	687	146	1055	1897	842
47	527	941	414	97	834	1526	692	147	1059	1902	843
48	534	954	420	98	840	1536	696	148	1063	1907	844
49	540	966	426	99	845	1546	701	149	1067	1912	845
50	547	979	432	100	851	1556	705	150	1071	1917	846

The International Seismological Summary for 1922 July, August, September.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number of the Summary deals with 89 epicentres, 31 of which are new and 58 repetitions from old epicentres. Corresponding figures are, since the beginning of the Summary in its International form :—

	New.				Old.			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
1918	36	44	43	35	44	38	67	53
1919	20	27	31	22	34	41	91	33
1920	24	27	31	27	47	48	49	42
1921	31	29	26	18	30	36	36	47
1922	32	38	31		36	51	58	

The cases of assumed abnormal focal depth are :—

Date.		Epicentre.		Depth below normal.
d.	h.	°	°	
July 10	9	15·2S.	61·0W.	+·050
Aug. 3	9	18·5S.	168·5E.	+·020
Aug. 14	11	52·0N.	131·5E.	+·010
Sept. 4	17	9·0S.	66·0W.	+·080
Sept. 22	21	25·2N.	46·6W.	+·045

All these cases have been scrutinised with some care, and it seems clear that unless some of the evidence is defective to an extent which we have no warrant to assume, or some alternative hypothesis of a novel kind is invented, the focal depth must be considerable in all cases but that of August 14. On July 10, September 4, and September 22 the evidence of La Paz is practically vital, but the observations at that observatory have shown themselves worthy of confidence.

There were three shocks from apparently the same epicentre 36°·0N. 28°·0E. on Aug. 11d. 8h. 19·6m., 13d. 0h. 19·8m., 13d. 12h. 46·0m., for which direct comparisons are given as a test of the identity of focus.

For the North Formosa shocks of September 1 and September 14 an interesting note furnished by the Taihoku Observatory has been reproduced.

The work of collation still suffers from the delay in communicating results, although the effects of the war should now be almost negligible.

Those observers who have not already communicated their readings for 1922 and 1923 are urgently requested to send them without delay to the University Observatory, Oxford.

H. H. TURNER.

University Observatory, Oxford,
1926 March 24.

In correcting the proof the following approximate solutions were found for two cases previously relegated to the Notes:—

July 14d. 3h. 28m. 20s. Epicentre $2^{\circ}08'S$, $128^{\circ}5'E$. (as on 1921 May 20d.).

$A = -.622$, $B = +.782$, $C = -.035$; $D = +.783$, $E = +.622$;
 $G = +.022$, $H = -.027$, $K = -.999$.

	Δ °	Az. °	P. m. s.	O - C. s.	L. m.	M. m.
Manila	18.2	336	e 4 30	+11	—	—
Batavia	22.0	258	i 5 2	- 3	—	—
Zi-ka-wei	33.9	352	e 6 55	- 8	—	—
Adelaide	34.3	165	—	—	—	16.9
Riverview	38.2	148	—	—	e 19.4	—
De Bilt	111.4	326	—	—	e 59.7	—
Uccle	112.4	325	—	—	—	58.7

Additional readings: Batavia $e = +2m.32s$. Adelaide $M = +22.0m$.
De Bilt $eLN = +61.7m$.

July 14d. 21h. 10m. 22s. Epicentre $23^{\circ}3'N$, $122^{\circ}0'E$. (as on 1921 July 2d.).

$A = -.487$, $B = +.779$, $C = +.396$; $D = +.848$, $E = +.530$;
 $G = -.209$, $H = +.335$, $K = -.918$.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Taihoku	1.8	345	e 0 51	+23	—	—	1.4	2.0
Hong Kong	7.3	264	1 43	-18	—	—	—	5.1
Zi-ka-wei	7.9	356	e 3 48	?S	(e 3 48)	+14	—	5.8
Manila	8.8	186	e 2 8	- 5	—	—	—	—
De Bilt	86.7	326	—	—	—	—	e 47.6	48.8
Uccle	87.8	325	—	—	—	—	e 46.6	—
Eskdalemuir	88.6	331	—	—	—	—	46.6	—

Additional reading: De Bilt $eLN = +46.6m$.

1922 JULY, AUGUST, & SEPTEMBER.

July 1d. 8h. 5m. 10s. Epicentre $37^{\circ}5N$. $19^{\circ}7E$. (as on 1922 June 29d.).

$$A = +.747, B = +.267, C = +.609; \quad D = +.337, E = -.941; \\ G = +.573, H = +.205, K = -.793.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	3.2	81	e 0 51	+ 1	(e 1 27)	- 1	e 1.4	2.6
Rocca di Papa	6.8	311	e 3 58	?L	—	—	(e 4.0)	5.3
Belgrade	7.3	4	e 2 15	+24	e 4 10	?L	(e 4.2)	5.2
Zagreb	8.8	341	e 1 50	-23	—	—	e 4.8	6.2

Zagreb gives also MNW = +6.3m.

July 1d. Readings also at 0h. (Florence), 2h. (Manila and near Tokyo), 11h. (near Oaxaca), 12h. (near Vera Cruz and Tacubaya), 16h. (Coimbra), 17h. (Nagasaki and near Zurich), 19h. (Zagreb), 20h. (Manila), 23h. (Port au Prince).

July 2d. 8h. 26m. 30s. Epicentre $35^{\circ}0N$. $142^{\circ}0E$.

$$A = -.646, B = +.504, C = +.574; \quad D = +.616, E = +.788; \\ G = -.452, H = +.353, K = -.819.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	2.0	290	0 35	+ 4	e 1 0	+ 5	1.5	2.0
Mizusawa	4.2	351	1 8	+ 3	1 54	- 1	—	—
Nagoya	4.2	274	0 51	-14	—	—	—	—
Osaka	5.4	268	2 8	?S	(2 8)	-20	3.3	5.5
Kobe	5.7	268	2 29	?S	(2 49)	- 7	4.5	6.1
Zi-ka-wei	17.7	264	e 3 38	-35	e 7 44	+11	—	11.7
Zagreb	85.6	326	—	—	e 23 54	+28	—	—

Additional readings: Tokyo gives also MN = +2.5m. Mizusawa PN = +1m.6s. Osaka MN = +4.6m.

July 2d. 13h. 29m. 48s. Epicentre $23^{\circ}3N$. $122^{\circ}0E$. (as on 1921 April 2d.).

$$A = -.487, B = +.779, C = +.396; \quad D = +.848, E = +.530; \\ G = -.209, H = +.335, K = -.918.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.8	345	0 25	- 3	(0 44)	- 7	0.7	0.9
Hong Kong	7.3	264	1 34	-17	—	—	4.2	4.5
Zi-ka-wei	7.9	356	e 2 0	0	e 3 34	0	—	4.8
Manila	8.8	186	e 2 16	+ 3	—	—	4.6	4.9
Colombo	43.7	256	15 12	?S	(15 12)	+14	(27.7)	—

Additional readings: Zi-ka-wei gives also MZ = +5.4m. Manila MN = +4.6m. Colombo readings are given as P and S.

1922. July 2d. 13h. 35m. 48s. Epicentre $54^{\circ}0N$ $160^{\circ}5W$.

$$A = -.554, B = -.196, C = +.809; \quad D = -.334, E = +.943; \\ G = -.763, H = -.270, K = -.588.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Sitka	E. 14.5	68	e 3 33	0	9 25	?	e 11.6	11.9
Victoria	23.7	88	4 24	-61	(i 9 49)	+11	i 10.1	12.2
	Z. 23.7	88	5 18	- 7	(9 52)	+14	9.9	12.1
Berkeley	30.5	105	i 6 36	+ 3	11 42	- 1	i 14.8	—
Lick	E. 31.3	105	—	—	e 11 52	- 4	e 15.0	15.9
Honolulu	32.7	175	6 57	+ 3	12 7	-12	15.2	18.0
Tucson	41.1	100	e 7 5	-59	14 11	-11	23.2	—
Mizusawa	41.4	273	7 54	-12	14 6	-21	—	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo		44.6	271	e 9 11	+41	e 15 45	+35	e 22.2	—
Osaka		47.8	273	8 50	-3	15 46	-5	21.8	25.1
Kobe		48.0	273	8 4	-50	—	—	21.7	24.8
Chicago		48.1	74	i 8 51	-4	15 43	-12	22.9	29.7
St. Louis		48.7	78	i 9 0	+2	i 16 0	-2	e 20.1	28.2
Ann Arbor		49.9	70	9 12	+8	16 12	-6	e 24.2	—
Toronto		51.4	66	10 36	+60	i 16 48	+12	i 23.7	31.7
Nagasaki		52.4	276	9 22	0	—	—	—	—
Ithaca		53.8	65	e 9 36	+4	16 53	-13	e 28.2	—
Northfield		54.6	61	e 14 27	?PR ₁	—	—	e 29.2	—
Georgetown	E.	55.9	69	e 9 57	+12	16 35	-58	e 24.2	—
	N.	55.9	69	e 9 46	+1	16 33	-60	e 30.6	—
Washington		55.9	69	10 37	+52	18 30	+57	27.5	—
Zi-ka-wei		58.5	280	e 10 5	+3	e 18 10	+5	e 25.1	30.2
Taihoku		63.0	276	—	—	e 19 4	+3	27.2	—
Upsala		66.1	1	10 56	+4	19 38	0	e 29.6	44.5
Dyce	N.	67.4	12	10 52	-8	20 12	+17	33.2	68.7
Apia		68.5	191	—	—	—	—	31.2	—
Edinburgh		68.5	13	e 11 38?	+30	20 16	+8	29.2	41.0
Eskdalemuir		69.1	13	i 11 13	+1	20 22	+7	33.2	40.1
Hong Kong		69.4	279	20 18	?S	(20 18)	-1	—	41.4
Stonyhurst		70.6	13	11 42	+21	20 42	+9	36.2?	42.9
Bidston		71.0	13	12 22	+59	21 37	+59	—	44.2
Konigsberg		71.1	0	i 11 23	-1	20 35	-4	e 32.0	35.2
		71.1	0	—	—	20 37	-2	—	40.2
Manila		71.5	270	e 11 48	+21	—	—	35.4	36.3
Hamburg		72.2	6	i 11 31	0	e 20 57	+5	e 32.2	51.2
Oxford		72.8	13	11 43	+8	21 8	+8	—	42.0
Kew		73.1	13	22 12	?S	(22 12)	+69	—	57.2
De Bilt		73.2	8	11 42	+5	21 6	+2	e 36.2	52.4
Uccle		74.4	9	11 45	0	21 0	-19	e 37.2	53.2
Lemberg		76.1	356	e 12 0	+4	e 20 54	-44	e 35.3	38.4
Paris		76.2	11	i 11 59	+3	i 21 42	+3	33.2	38.2
Strasbourg		76.9	7	i 11 59	-1	i 21 49	+1	e 35.2	47.5
Vienna		77.7	2	e 12 2	-3	i 21 58	+1	e 35.2	53.0
Zurich		78.2	8	e 12 6	-2	e 22 4	+2	—	—
Besançon		78.2	9	e 11 55	-13	22 15?	+13	36.2	—
Innsbruck		78.5	7	i 12 10	0	e 21 42	-24	e 34.7	55.8
Zagreb		80.1	2	12 21	+1	i 22 21	-3	e 33.2	58.7
Padova		80.4	7	12 15	-6	22 37	+9	—	—
Moncalieri		80.5	10	11 30	-52	22 1	-28	35.2	54.7
Belgrade		81.2	359	i 12 23	-3	i 21 48	-49	e 36.9	46.9
Simla	E.	81.4	315	12 24	-3	22 0	-39	40.5	43.0
	N.	81.4	315	12 6	-21	21 48	-51	44.4	51.3
Tiflis		81.8	343	e 12 48	+19	e 23 0	+16	e 32.8	—
Florence		82.0	8	12 27	-3	—	—	—	44.2
Marseilles		82.0	11	12 27	-3	22 54	+8	38.2	49.2
Coimbra	E.	82.8	22	12 34	-1	22 53	-2	34.4	46.0
	N.	82.8	22	—	—	—	—	37.4	44.4
Calcutta		83.4	301	12 39	+1	27 33	?SR ₁	42.0	48.6
Barcelona		83.4	13	12 37	-1	e 22 57	-4	e 40.7	48.7
Tortosa	N.	83.8	15	i 12 41	0	i 23 3	-4	37.3	51.9
Rocca di Papa	E.	84.1	6	i 12 39	-4	e 23 0	-9	e 47.0	62.2
	N.	84.1	6	—	—	—	—	e 46.1	60.2
Pompeii		85.1	5	e 12 45	-4	—	—	—	—
Rio Tinto		85.5	21	24 12	?S	(24 12)	+47	—	55.2
Graia		86.6	20	i 12 54	-3	i 23 31	-6	48.5	60.0
San Fernando		86.9	21	12 51	-7	23 36	-4	—	55.4
Al-iers		88.1	13	12 58	-8	23 41	-12	39.2	51.2
Bombay		94.0	311	16 46	?	28 44	?	—	56.8
Helwan		95.5	350	e 13 52	+6	—	—	51.2	59.2
Baavia		96.6	270	e 17 57	?	i 26 12	+50	e 48.0	—
River View		97.2	220	e 11 41	?	24 12	-76	e 42.8	—
Kolalaikal		99.4	302	23 24	?	—	—	60.4	63.9
Colombo		101.0	300	—	—	59 12	?L	63.5	64.2
Melbourne		103.1	222	—	—	—	—	e 55.2	68.0
La Paz		104.6	100	e 14 52	+20	27 2	+24	47.5	65.8

Additional readings and notes: Sitka gives also $e = +7m.35s.$ Victoria
 is given as iL . Honolulu $PN = +6m.46s.$, $SR_1 = +14m.1s.$, $T_0 =$
 $13h.35m.47s.$ Tucson $ePR_1E = +9m.38s.$, $ePR_1N = +9m.12s.$, $SR_1E =$
 $+17m.43s.$, $SR_1N = +17m.32s.$, $LN = +21.2m.$ Mizusawa $PN =$
 $+7m.53s.$ Osaka $MN = +24.4m.$ Kobe $MN = +24.4m.$ Toronto
 $iSR_1 = +20m.54s.$, $i = +27m.36s.$ Ithaca $ePR_1 = +11m.42s.$, $eN =$
 $+20m.42s.$ Georgetown $LE = +32.2m.$, $LN = +35.2m.$ Zi-ka-wei

Notes continued on next page.

MZ = +30.6m. Upsala MN = +44.3m. Eskdalemuir PR₂ = +15m.44s., SR₁ = +25m.34s. Bidston readings have been diminished by 1h. Manila MN = +35.7m. Hamburg eSN = +20m.52s., SR₁ = +26m.12s., SR₂ = +29m.12s. De Bilt eSR₁ = +26m.0s., MN = +45.5m. Uccle SR₁ = +26m.5s., SR₂ = +30m.39s., MN = +39.6m. Paris MN = +45.2m. Strasbourg SR₁ = +26m.52s., SR₂ = +31m.12s., MN = +54.6m. Vienna e = +18m.12s., i = +22m.18s. Zagreb iSNW = +22m.24s., MNW = +56.3m. Padova PR₁ = +13m.10s., SR₁ = +22m.54s. Moncalieri MN = +54.2m. Belgrade PR₁ = +12m.32s., PR₂ = +13m.17s., SR₁ = +22m.24s., L = +44.7m. Simla SE and SN diminished by 10m. Tiflis e = +16m.0s., e = +28m.18s. Calcutta PE = +12m.7s. Rocca di Papa eLN = +41.7m. Granada MN = +59.0m. San Fernando MN = +64.9m. La Paz (S) = +24m.57s., L = +54.7m.

July 2d. 20h. 6m. 48s. Epicentre 37°·0N. 20°·5E. (as on 1921 Oct. 25d.).

A = +.748, B = +.280, C = +.602; D = +.350, E = -.937;
G = +.564, H = +.211, K = -.799.

The epicentre of July 1d. will not suit.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Athens	2.8	69	0 40	- 4	(1 19)	+ 2	1.3	2.6
Rocca di Papa	7.6	311	e 3 36	?S	(e 3 36)	+10	—	—
Belgrade	7.8	0	e 1 59	+ 1	i 3 30	- 1	—	4.9
Zagreb	9.4	341	e 2 12	-10	—	—	e 4.7	6.1
Uccle	18.0	325	—	—	—	—	e 9.9	—

Additional readings: Athens gives also MN = +2.0m. Rocca di Papa iPE = +4m.0s., iPN = +4m.5s. Zagreb MNW = +7.9m.

July 2d. 21h. 23m. 48s. Epicentre 30°·0N. 90°·0W. (as on 1917 July 4d.).

A = -.000, B = -.866, C = +.500; D = -1.000, E = .000;
G = .000, H = -.500, K = -.866.

Very doubtful. The above is the only previously adopted origin in the neighbourhood.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Chicago	11.9	9	—	—	—	—	e 6.6	—
Ann Arbor	13.3	20	3 18	+ 1	5 54	+ 3	6.7	—
Georgetown	13.9	47	e 3 36	+11	5 57	- 9	—	—
Washington	13.9	47	—	—	e 5 5	-61	—	—
Cheltenham	13.9	48	e 4 48	+83	—	—	—	5.8
Ithaca	16.5	37	e 3 52	- 7	—	—	—	—

Ithaca gives also P = +3m.22s.

July 2d. Readings also at 0h. (Florence), 3h. (near Hokoto), 8h. (Pompeii, Zi-ka-wei, and near Tokyo), 10h. (Taihoku), 12h. (Kobe), 14h. (La Paz), 15h. (Batavia and Cape Town), 16h. (Sydney and Adelaide), 21h. (near Tokyo).

July 3d. 5h. 29m. 16s. Epicentre 8°·5S. 67°·0E.

A = +.386, B = +.910, C = -.148; D = +.920, E = -.391;
G = -.058, H = -.136, K = -.989.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Colombo	20.0	40	4 44	+ 3	8 44	+21	10.3	11.5
Kodaikanal	21.4	29	8 56	?S	(8 56)	+ 3	11.2	12.0
Bombay	28.0	12	10 47	?S	(10 47)	-12	—	—
Batavia	39.5	90	i 7 44	- 7	—	—	—	—
Simla	40.8	13	14 8	?S	(14 8)	-10	e 18.4	—
	40.8	13	13 38	?S	(13 38)	-40	e 18.5	—
Capetown	51.2	232	26 44	?L	—	—	(26.7)	—
Helwan	51.5	322	9 11	- 6	16 29	- 9	—	42.7
Tiflis	54.2	343	e 8 50	-44	—	—	e 21.7	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Hong Kong	55.5	58	17 42	?S	(17 42)	+14	—	32.2
Manila	58.3	68	e 10 23	+22	—	—	—	—
Taihoku	62.8	57	—	—	—	—	e 31.7	—
Zi-ka-wei	z. 65.4	50	10 58	+11	e 18 50	-40	—	38.4
Rocca di Papa	70.6	323	i 11 23	+2	—	—	—	—
Zagreb	70.9	327	i 11 23	+1	i 20 38	+1	42.7	—
Vienna	z. 72.1	330	i 11 30	-1	—	—	—	—
Moncalieri	75.4	323	10 35	-76	20 49	-41	30.8	—
Strasbourg	z. 77.1	327	12 0	-2	21 47	-3	e 34.7	—
Hamburg	78.4	331	e 12 8	-1	e 22 2	-3	e 42.7	49.7
Tortosa	N. 78.4	318	12 12	+3	e 22 7	+2	e 46.7	—
Upsala	78.8	338	e 12 11	-1	e 22 5	-5	e 35.1	—
Uccle	80.0	327	e 12 17	-2	e 22 19	-4	—	—
Granada	80.0	312	i 12 25	+6	e 22 38	+15	—	—
De Bilt	80.2	329	—	—	22 26	+1	e 39.7	—
Kew	83.0	325	—	—	—	—	—	61.7
Coimbra	84.7	312	e 22 58	?S	(e 22 58)	-18	e 44.0	—
Stonyhurst	85.1	327	e 23 14	?S	(e 23 14)	-6	—	56.2
Bidston	85.3	327	—	—	—	—	—	56.7
Eskdalemuir	86.1	329	—	—	e 23 19	-12	43.7	—

Additional readings and notes: Batavia gives also $i = +8m.29s.$ Tiflis
 $e = +10m.26s., +12m.26s.,$ and $+18m.50s.$ De Bilt $eLN = +41.7m.$
 Coimbra $eLN = +45.0m.$

July 3d. 8h. 21m. 45s. Epicentre $37^{\circ}.5N. 19^{\circ}.7E.$ (as on 1d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	3.2	81	e 1 4	+14	—	—	e 1.7	2.4
Rocca di Papa	6.8	311	e 3 39	?L	—	—	(e 3.6)	—
Belgrade	7.3	4	e 1 35	-16	e 3 19	+1	—	3.6
Zagreb	8.8	341	e 2 15	+2	—	—	—	5.4
Hamburg	17.4	340	—	—	—	—	e 9.2	—

Additional readings: Athens gives also $MN = +2.2m.$ Rocca di Papa $iPN = +4m.27s., iPE = +4m.39s.$ Zagreb $MNW = +8.4m.$

July 3d. Readings also at 2h. (Port au Prince, Zi-ka-wei, and near Tokyo), 6h. (Cipolletti), 9h. (near Belgrade), 10h. (Simla), 12h. (Zi-ka-wei), 13h. (Batavia, Manila, Zi-ka-wei, and near La Paz), 15h. (Tiflis), 20h. (near Taihoku), 21h. (near La Paz).

July 4d. Readings at 5h. (Riverview and Wellington), 13h. (Toronto and Tacubaya), 19h. (Athens).

July 5d. 18h. 35m. 36s. Epicentre $54^{\circ}.0N. 160^{\circ}.5W.$ (as on July 2d.).

$A = -.554, B = -.196, C = +.809; D = -.334, E = +.943;$
 $G = -.763, H = -.270, K = -.588.$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Berkeley	z. 30.5	105	—	—	—	—	e 15.0	—
Honolulu	32.7	175	—	—	—	—	e 15.2	17.8
Chicago	48.1	74	—	—	e 15 44	-11	28.2	—
Bidston	71.0	13	28 24	?L	32 29	?L	(32.5)	44.4
De Bilt	73.2	8	—	—	e 21 6	+2	e 36.4	43.6
Uccle	74.4	9	e 11 46	+1	e 21 24	+5	e 38.4	—
Strasbourg	76.9	7	12 0	0	—	—	44.4	—
Vienna	z. 77.7	2	i 12 5	0	—	—	—	—
Zagreb	80.1	2	e 12 21	+1	e 22 24	0	e 36.4	58.4
Tiflis	81.8	343	—	—	—	—	e 47.4	—
Coimbra	N. 82.8	22	66 30	?L	—	—	—	—
Rocca di Papa	E. 84.1	6	e 12 42	-1	23 12	+3	—	—
	N. 84.1	6	i 12 36	-7	23 6	-3	—	—

Additional readings: Honolulu gives also $eN = +15m.24s.$ De Bilt $MN = +45.4m.$

July 5d. 20h. 20m. 0s. Epicentre $38^{\circ} \cdot 5N$. $144^{\circ} \cdot 5E$. (as on 1917 June 14d.).

A = -·637, B = +·455, C = +·623; D = +·581, E = +·814;
G = -·507, H = +·361, K = -·783.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Mizusawa	E.	2·7	283	0 33	- 9	—	—	—	—
Tokyo		4·7	235	i 1 20	+ 7	1 49	-20	2·3	2·4
Nagoya		6·9	243	1 42	- 3	(2 52)	-15	2·9	3·6
Osaka		8·2	245	2 8	+ 4	(3 30)	-12	3·5	4·6
Kobe		8·4	246	2 3	- 4	2 41	?	3·3	4·0
Zi-ka-wei		20·2	256	e 4 31	-12	e 7 58	-29	—	—
Hong Kong		30·5	244	11 0	?S	(11 0)	-43	—	—
Apia		66·4	133	35 33	?L	—	—	(35·6)	36·0
Upsala		72·4	335	e 11 34	+ 2	e 21 3	+ 8	e 38·1	45·8
Riverview		72·6	175	—	—	—	—	e 41·4	—
Konigsberg		75·1	330	i 11 50	0	—	—	e 38·7	47·0
Hamburg		79·9	335	i 12 18	0	—	—	e 41·0	49·0
Edinburgh		81·6	342	—	—	—	—	e 45·0	—
Vienna	Z.	81·8	329	i 12 28	- 1	e 23 0	+16	—	48·0
Eskdalemuir		82·2	342	—	—	—	—	48·0	—
Belgrade		82·7	324	e 16 33	?PR ₁	—	—	33·8	—
De Bilt		82·7	336	—	—	22 48	- 6	e 39·0	47·3
Stonyhurst		83·3	341	—	—	—	—	—	54·0
Bidston		83·9	341	13 44	+63	24 0	+52	—	55·0
Zagreb		83·9	327	12 39	- 2	—	—	e 43·0	53·4
Uccle		84·1	336	e 12 38	- 5	e 23 42	+33	e 39·0	52·0
Kew		84·9	340	—	—	—	—	—	55·0
Strasbourg		84·9	333	12 44	- 3	23 37	+19	45·0	—
Oxford		85·0	340	—	—	i 23 9	-10	43·0	53·5
Rocca di Papa		88·5	324	i 13 2	- 6	e 23 36	-22	55·6	—
Coimbra		97·4	340	—	—	—	—	e 49·0	—
La Paz		143·9	62	19 58	[+11]	—	—	—	—

Additional readings: Mizusawa gives also PN = +34s. Osaka MN = +4·3m.
Kobe MN = +4·4m. Upsala MN = +45·0m. Hamburg MN = +44·0m.
Belgrade e = +17m.6s. and +18m.52s., eL = +20·5m., L = +21·5m. De
Bilt MN = +51·0m. Zagreb MNW = +46·0m. Rocca di Papa PR₁
= +16m.30s., eSN = +23m.24s., L = +58·2m.

July 5d. Readings also at 5h. (Merida and Colombo), 6h. (Batavia), 14h. (Manila and Batavia), 17h. (Vienna), 18h. (near Tokyo).

July 6d. Readings at 2h. (Apia), 3h. (near La Paz), 5h. (Mizusawa), 7h. (Apia), 13h. and 14h. (near Mizusawa), 18h. (near La Paz), 23h. (Riverview).

July 7d. Readings at 1h. (near Colima), 7h. (Colombo), 14h. (La Paz), 16h. (Rio Tinto and near Zurich), 17h. (Nagoya (2), near Mizusawa (2), and near Tokyo (3)), 19h. (near Tokyo and near Mizusawa), 20h. (Pompeii and Rocca di Papa), 21h. (Rocca di Papa (2)).

July 8d. Readings at 2h. (near Osaka, Mizusawa (2), and Tokyo (2)), 3h. (Rocca di Papa), 4h. (Malaga and near Granada), 9h. (near Mizusawa), 12h. (La Paz), 14h. and 15h. (near Mizusawa), 18h. (near Tacubaya), 21h. (Manila).

July 9d. Readings at 3h. (near Batavia), 9h. (Taihoku, Zi-ka-wei, Manila, and Hong Kong), 12h. (Zagreb), 14h. (near Tacubaya), 16h. (near Zurich and near Rocca di Papa), 17h. (Stonyhurst).

July 10d. 9h. 37m. 57s. Epicentre 15°·2S. 61°·0W. (as on 1919 Sept. 16d.).

A = +·468, B = -·844, C = -·262; D = -·875, E = -·485;
G = -·127, H = +·229, K = -·965.

A depth of focus 0·050 is assumed on the evidence of La Paz. Without that the other observations could be satisfied by moving the epicentre some 8° or 9° north.

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
					m. s.	s.	m. s.	s.	m.	m.
La Paz		-0·3	7·0	258	i 1 51	+ 9	—	—	3·1	3·2
Andalgala	N.	-1·1	13·3	201	2 57	- 5	—	—	4·4	4·6
Pilar		-1·4	16·7	188	—	—	—	—	4·7	11·2
Mendoza		-2·4	18·9	200	2 15	-104	—	—	2·4	3·0
Cipolletti		-2·6	24·6	193	—	—	(9 3)	- 2	9·0	10·0
Tacubaya	E.	-4·9	51·1	313	8 26	-15	15 56	+25	—	—
	N.	-4·9	51·1	313	8 24	-17	15 1	-30	—	—
Washington		-5·3	56·1	347	—	—	e 17 3	+34	—	—
Ithaca		-5·5	59·4	350	e 9 37	+ 5	e 17 17	+ 9	—	—
Northfield		-5·5	60·3	351	—	—	e 16 3	-76	—	—
Chicago		-5·6	62·0	340	9 48	0	17 35	- 4	—	—
Ottawa		-5·6	62·1	350	9 56	+ 7	17 53	+13	25·6	—
Coimbra		-6·0	73·9	40	11 15	+12	20 21	+20	29·0	—
Granada		-6·0	75·1	45	i 11 14	+ 2	i 20 32	+17	e 33·0	38·6
Algiers		-6·2	79·6	48	11 41	+ 3	21 3	- 4	—	—
Tortosa		-6·2	79·8	43	11 41	+ 1	21 13	+ 4	e 33·0	34·5
Bidston		-6·4	84·5	31	13 58?	+110	18 3	? PR ₁	—	28·0
Kew		-6·4	84·9	33	—	—	—	—	—	22·0
Paris		-6·4	85·1	37	(e 12 3)	- 8	—	—	e 12·0	—
Eskdalemuir		-6·4	85·5	30	e 12 13	- 1	i 21 45	-28	—	—
Zurich		-6·5	88·0	40	12 21	- 7	21 59	-42	—	—
Strasbourg		-6·5	88·0	40	12 22	- 6	22 0	-41	e 35·0	—
De Bilt		-6·5	88·3	35	—	—	i 22 2	-42	e 36·0	—
Rocca di Papa		-6·5	88·4	47	i 12 21	- 9	—	—	—	12·6
Padova		-6·5	89·3	42	—	—	22 11	-44	—	—
Hamburg		-6·5	91·4	35	e 17 3	? PR ₁	i 22 19	-59	47·0	—
Zagreb		-6·5	92·1	43	e 12 51	0	i 22 22	-64	52·0	—
Manila		—	178·0	252	e 24 40	? PR ₁	—	—	—	—

Additional readings and notes: Andalgala readings have been increased by 12 min. Ithaca gives also e = +12m.4s. Chicago SR₁ = +21m.6s. Ottawa i = +18m.48s., eE = +21m.23s., T₀ = 9h.38m.0s. Eskdalemuir eZ = +14m.21s. and +15m.55s.

July 10d. Readings also at 3h. (Tiflis and Rocca di Papa), 8h. (Taihoku), 9h. Malaga and near Granada), 13h. (Malaga and near Granada).

July 11d. 14h. 13m. 0s. Epicentre 22°·3N. 143°·2E. (as on 1920 Jan. 12d.).

A = -·741, B = +·554, C = +·380; D = +·599, E = +·801;
G = -·304, H = +·227, K = -·925.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Tokyo	13·7	348	e 4 3	+41	—	—	e 6·8	7·0
Nagoya	14·0	338	2 52	-34	—	—	—	—
Osaka	14·1	333	3 27	0	—	—	—	6·8
Kobe	14·2	332	3 31	+ 2	—	—	—	6·4
Nagasaki	15·8	314	3 50	+ 1	—	—	—	6·6
Mizusawa	16·9	355	4 4	0	(7 8)	- 8	—	—
Manila	22·5	254	e 5 0	-11	—	—	9·8	—
Batavia	45·6	236	i 7 47	-50	—	—	—	—
Konigsberg	88·6	331	—	—	23 1	- 58	47·4	—
Hamburg	94·0	334	—	—	e 23 0	-116	45·0	—
Zagreb	96·8	326	—	—	i 23 44	-100	49·0	—
De Bilt	97·0	336	—	—	e 23 47	-99	e 48·0	54·7
Eskdalemuir	97·3	342	—	—	e 23 48	-101	e 39·0	—
Uccle	98·4	335	—	—	e 23 54	-106	e 49·0	—
Strasbourg	98·7	330	—	—	—	—	e 51·0	—
Kew	99·5	340	—	—	—	—	—	24·0
La Paz	149·9	85	19 46	[-10]	—	—	—	—

Additional readings: Kobe gives also MN = +4·5m. Mizusawa S is given as the P of a subsequent shock close to Mizusawa, for which S-P = 11s. Zi-ka-wei (Δ -21°·3), gives simply 14h. De Bilt MN = +55·6m. Eskdalemuir e = +26m.2s., eS? = +31m.17s.

July 11d. Readings also at 21h. (Algiers).

July 12d. 5h. 11m. 46s. Epicentre $35^{\circ}0'N$. $24^{\circ}0'E$. (as on 1920 Sept. 6d.).

A = +.748, B = +.333, C = +.574; D = +.407, E = -.914;

G = +.524, H = +.233, K = -.819.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	2.9	356	0 51	+ 6	(i 1 17)	- 3	i 1.3	1.4
Pompeii	9.4	310	c 3 4	+42	—	—	—	—
Belgrade	10.2	346	e 2 30	- 3	e 4 37	+ 2	—	5.3
Rocca di Papa	11.1	311	e 2 50	+ 4	(e 4 38)	-19	—	5.5
Zagreb	12.5	332	e 2 44	-22	—	—	—	6.0
Strasbourg	18.1	324	—	—	e 8 14	+32	—	—
Uccle	21.2	324	—	—	—	—	e 10.2	—
De Bilt	21.7	328	—	—	—	—	e 10.5	11.4
Eskdalemuir	27.6	326	—	—	—	—	13.2	—

Additional readings and notes: Athens PN = +52s., iPE = +53s., MN = +1.9m. Belgrade eP = +3m.59s. Rocca di Papa eNE = +2m.56s., eE = +3m.38s. S is given as PR₁. Zagreb MNW = +7.1m.

July 12d. Readings also at 4h. (Kobe, Nagasaki, and Osaka), 5h. (near Tacubaya), 6h. (Hamburg and Rocca di Papa), 9h. (near Tokyo), 11h. (Rocca di Papa and Pompeii), 19h. (Manila).

July 13d. 1h. 22m. 46s. Epicentre $43^{\circ}2'S$. $148^{\circ}5'E$.

A = -.622, B = +.381, C = -.685; D = +.522, E = +.853;

G = +.584, H = -.358, K = -.729.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Melbourne	6.0	332	1 32	0	2 44	0	3.5	4.3
Riverview	9.5	13	—	—	—	—	e 3.9	—
Sydney	9.5	13	2 20	- 3	(4 2)	-14	4.0	4.9
Adelaide	11.3	314	c 3 14	+25	e 5 14	+12	—	8.2
Christchurch	17.5	99	7 38	?S	(7 38)	+ 9	11.3	12.2
De Bilt E.	154.1	303	—	—	—	—	e 88.2	—
Uccle	154.7	300	—	—	—	—	—	84.2
Eskdalemuir	158.2	313	—	—	—	—	82.2	—
Stonyhurst	158.2	310	—	—	—	—	—	96.2

Additional readings and notes: Christchurch readings have been increased by 10m. De Bilt gives also eLN = +86.2m.

July 13d. 4h. 58m. 0s. Epicentre $6^{\circ}3'N$. $123^{\circ}2'E$. (as on 1922 June 24d.).

A = -.544, B = +.832, C = +.110; D = +.837, E = +.548;

G = -.060, H = +.092, K = -.994.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila	8.6	346	e 2 6	- 4	5 56	?L	7.6	8.2
Taihoku	18.8	355	4 30	- 3	7 51	- 7	10.4	—
Batavia	20.6	233	5 9	+21	i 9 7	+31	e 23.4	—
Zi-ka-wei	25.0	356	e 5 15	-23	e 9 30	-33	—	14.7
Kobe	30.5	21	6 25	- 8	—	—	14.5	17.5
Osaka	30.6	21	6 45	+11	—	—	—	19.6
Tokyo	33.1	25	i 7 5	+ 8	(e 13 1)	+35	e 13.0	17.4
Colombo	43.0	273	10 0	?	14 48	0	19.0	31.0
Adelaide	43.8	161	—	—	i 14 48	-11	e 22.0?	26.4?
Kodaikanal	45.5	278	14 24	?S	(14 24)	-57	27.2	31.4
Riverview	48.1	148	e 11 27	?PR ₁	e 15 48	- 7	e 26.7	—
Simla N.	49.7	309	—	—	e 16 0	-15	—	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Tiflis	77.2	313	e 12 18	+16	e 22 6	+15	e 37.0	45.2
Honolulu	77.3	70	—	—	e 21 0	-52	—	—
Helwan	88.4	300	e 13 5	-2	24 0	+4	—	62.0
Konigsberg	92.1	327	23 57	?S	(23 57)	-39	51.3	—
Vienna	96.3	321	e 17 36	?PR ₁	—	—	—	54.0
Zagreb	97.2	318	e 17 54	?PR ₁	—	—	e 48.0	55.0
Hamburg	98.2	326	—	—	e 25 0	-38	e 50.0	54.0
Rocca di Papa	100.8	314	e 15 18	+64	e 25 42	-21	e 48.5	—
Strasbourg	101.5	321	e 19 0	?PR ₁	—	—	e 56.0	—
De Bilt	E. 101.6	325	—	—	e 24 6	-125	e 49.0	57.2
	N. 101.6	325	—	—	e 25 49	-22	—	53.6
Dyce	N. 102.6	334	—	—	e 25 26	-54	50.9	57.3
Uccle	102.6	325	—	—	e 25 18	-62	e 48.0	57.2
Besançon	103.2	321	—	—	—	—	56.0	—
Edinburgh	103.8	332	—	—	—	—	54.0	—
Eskdalemuir	104.2	331	—	—	e 25 30	-65	49.0	58.4
Paris	104.5	323	—	—	e 32 4	?SR ₁	e 52.0	60.0
Stonyhurst	104.6	330	e 31 30	?SR ₁	42 30	?	57.5	66.0
Kew	104.8	328	—	—	—	—	—	68.0
Bidston	105.2	330	—	—	35 35?	?SR ₁	—	52.7
Oxford	105.2	328	—	—	i 25 38	-66	52.1	64.9
Tortosa	N. 109.5	317	—	—	—	—	e 53.0	60.1
Granada	114.1	315	—	—	—	—	e 57.0	68.5
Coimbra	115.9	320	e 13 35	-110	26 30	-107	e 52.5	—
Chicago	124.3	27	—	—	e 27 0	-141	77.3	—
Ottawa	125.6	15	e 20 55	?PR ₁	—	—	60.0	—
La Paz	165.0	134	16 27	?	—	—	(60.6)	—

Additional readings and notes: Manila gives also MN = +8.5m. Zi-ka-wei
 PSN = +9m.49s., PSE = +9m.54s., MN = +14.8m. Kobe MN = +16.6m.
 Osaka MN = +20.0m. Adelaide iSR₁ = +18m.48s. Riverview
 eS = +19m.28s. Simla eN = +14m.6s. Rocca di Papa ePE =
 +16m.57s., iPN = +17m.29s., eS = +32m.15s. Dyce iN = +28m.16s.
 Eskdalemuir e? = +33m.45s., e = +38m.30s., MN = +57.9m. Paris
 MN = +58.0m. La Paz readings are given as P of separate shocks.

July 13d. Readings also at 3h. (Pompei and near Rocca di Papa), 9h. (La Paz),
 10h. (Colombo, Manila, Zi-ka-wei, Batavia, and Simla), 11h. (De Bilt
 and La Paz), 13h. (Manila), 17h. (De Bilt), 20h. (La Paz), 21h. (Taihoku,
 De Bilt, Manila, Zi-ka-wei, Hong Kong, Eskdalemuir, and Uccle).

July 14d. 9h. 19m. 21s. Epicentre 38° 0N. 128° 0E.

A = -.485, B = +.621, C = +.616; D = +.788, E = +.616;
 G = -.379, H = +.485, K = -.788.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Kobe	6.6	118	1 41	0	—	—	3.6	5.7
Osaka	6.9	117	2 3	+18	—	—	3.6	4.5
Nagoya	7.7	110	1 53	-4	—	—	3.5	3.6
Tokyo	9.7	101	i 2 24	-2	—	—	i 2.9	3.3
Mizusawa	E. 10.3	80	2 34	0	4 34	-3	—	—
	N. 10.3	80	2 31	-3	4 35	-2	—	—
Manila	24.2	197	c 7 6	?	—	—	—	—

Additional readings: Kobe gives also MN = +4.6m. Osaka MN = +4.0m.
 Tokyo MN = +3.2m.

July 14d. Readings also at 2h. (Batavia), 3h. (Batavia, Manila, Zi-ka-wei,
 Adelaide, Riverview, and near Christchurch), 4h. (De Bilt and Uccle),
 5h. (De Bilt and Uccle), 11h. (near Tokyo and Mizusawa), 15h.
 (Nagasaki), 18h. (near Rocca di Papa).

July 15d. Readings at 3h. (Osaka, Kobe, and Taihoku), 6h. (La Paz), 15h.
 (La Paz and near Tacubaya), 17h. (Taihoku), 20h. (Riverview and near
 Christchurch).

July 16d. Readings at 2h. (Bidston), 8h. (La Paz), 11h. (Paris), 19h. (Oaxaca), 20h. (near Mizusawa), 23h. (Manila).

July 17d. Readings at 0h. (near Granada), 4h. (Christchurch, Melbourne, Tortosa, and Manila), 5h. (near La Paz), 13h. (near Tokyo), 19h. (La Paz), 21h. (Zi-ka-wei and near Manila).

July 18d. Readings at 3h. (Colombo and Moncalieri), 4h. (Merida), 7h. (near Algiers), 8h. (Bidston), 9h. (Christchurch, Riverview, Adelaide, and Colombo), 18h. (Batavia), 22h. (Batavia and Manila).

July 19d. 12h. 54m. 50s. Epicentre $25^{\circ}5'N$. $120^{\circ}0'E$.

$A = -\cdot451$, $B = +\cdot782$, $C = +\cdot431$; $D = +\cdot866$, $E = +\cdot500$;
 $G = -\cdot215$, $H = +\cdot373$, $K = -\cdot903$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		\circ	\bullet	m. s.	s.	m. s.	s.	m.	m.
Taihoku	E.	1.5	109	0 18	- 5	—	—	0.5	0.5
Hokoto		2.0	206	0 34	+ 3	—	—	1.1	1.4
Zi-ka-wei		5.8	12	e 1 38	+ 8	e 3 7	?L (e 3.1)	—	4.0
Hong Kong		6.2	240	1 40	+ 5	—	—	—	4.7
Manila		11.0	175	e 2 27	-17	—	—	4.6	—
Nagasaki		11.2	47	2 58	+11	—	—	—	—
Tokyo		19.8	54	e 3 22	-77	—	—	—	—
Batavia		34.2	204	e 7 4	- 3	i 12 52	+ 9	—	—
Colombo		42.6	251	18 10	?SR ₁	—	—	—	—
Hamburg		80.6	326	—	—	e 21 10	-80	45.2	53.2
Zagreb		81.0	317	—	—	e 23 10	+35	45.2	—
De Bilt		83.9	326	—	—	—	e 43.2	49.1	—
Dyce	N.	84.1	333	—	—	—	—	45.2	—
Strasbourg		84.5	322	—	—	—	e 46.2	—	—
Uccle		85.0	326	—	—	—	e 43.2	48.2	—
Edinburgh		85.4	332	—	—	—	e 44.2	56.2	—
Eskdalemuir		85.8	332	—	—	e 23 30	+ 2	42.2	47.2
Moncalieri		86.4	320	—	—	e 23 33	- 1	47.7	—
Stonyhurst		86.5	330	e 45 40	?L	—	(e 45.7)	51.7	—
Kew		86.9	328	—	—	—	—	56.2	—
Bidston		87.0	330	—	—	—	—	59.0	—
Paris		87.2	324	—	—	e 47 10	? e 55.2	57.2	—
Oxford		87.3	328	—	—	i 23 20	-24	43.7	48.7
Coimbra		98.6	323	e 21 28	? e 30 28	—	? c 53.2	—	—
La Paz		168.2	42	20 16	[+ 2]	—	—	—	—

Additional readings: Zi-ka-wei MN = +4.3m., MZ = +5.0m. Hamburg
e = +37m.10s. Moncalieri S? = +30m.37s.

July 19d. Readings also at 9h. (Colombo), 12h., 13h. (2), and 15h. (Taihoku), 16h. (Zi-ka-wei and near Manila), 17h. (Taihoku and Nagasaki), 20h. (Taihoku (2)), 21h. (Taihoku and La Paz).

July 20d. Readings at 1h. (near Taihoku), 8h. (Sydney, Riverview, La Paz, Taihoku (2), Zi-ka-wei, Manila, and Batavia), 10h., 11h., 12h., and 16h. (Taihoku), 17h. (La Paz), 18h. (Algiers and Rocca di Papa), 20h. (Taihoku (2) and La Paz).

July 21d. Readings at 0h. (Taihoku, Wellington, and Manila), 1h. (Taihoku), 3h. (La Paz and near Rocca di Papa), 6h. (Manila), 8h. (Taihoku (2)), 12h. (Taihoku), 17h. (near Tacubaya), 18h. (Dyce), 20h. (Zi-ka-wei), 21h. (near Tacubaya), 22h. (Zi-ka-wei and near Tacubaya), 23h. (Taihoku (2) and near Mizusawa).

July 22d. 13h. 17m. 0s. Epicentre $55^{\circ}0'N$. $38^{\circ}0'E$. (as on 1921 Oct. 2d.).

A = +.452, B = +.353, C = +.819; D = +.616, E = -.788;

G = +.646, H = +.504, K = -.574.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Belgrade	15.1	235	e 4 10	+30	(6 0)	-34	6.0	—
Hamburg	16.3	277	—	—	—	—	e 7.0	14.0
Zagreb	16.6	246	e 4 54	+54	e 7 6	-3	—	8.7
Strasbourg	19.6	264	e 3 55	-41	—	—	e 11.0	—
De Bilt	19.6	275	—	—	—	—	e 12.0	—
Uccle	20.5	271	—	—	e 8 24	-10	e 11.7	—
Moncalieri	21.7	255	—	—	e 8 21	-38	10.9	—
Eskdalemuir	23.2	288	—	—	—	—	10.0	—
Algiers	29.9	247	11 34	?S	(11 34)	+2	—	—

Additional readings: Belgrade gives also e = +5m.25s., L = +7.0m. De
Bilt e = +9m.0s. Zante ($\Delta = 21^{\circ}7'$, Az. = 225°) gives simply 13h.13m.

July 22d. 16h. 26m. 46s. Epicentre $35^{\circ}0'N$. $22^{\circ}5'E$. (as on 1922 June 5d.).

A = +.757, B = +.313, C = +.574; D = +.383, E = -.924;

G = +.530, H = +.220, K = -.819.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	3.1	18	1 0	+11	i 1 51	+25	2.1	2.5
Pompeii	8.5	315	e 3 32	?S	(e 3 32)	-18	—	—
Helwan	9.1	122	2 15	-3	3 45	-21	—	9.7
Belgrade	9.9	352	e 2 11	-18	—	—	i 5.7	6.9
Rocca di Papa	10.2	314	i 2 34	+1	e 4 32	-3	—	11.2
Zagreb	11.9	337	e 2 56	-2	i 5 15	-2	e 6.3	9.0
Padova	13.1	325	3 26	+12	8 50	?L	(8.8)	12.2
Vienna	14.0	343	e 3 33	+7	i 6 29	+21	—	9.7
Lemberg	14.8	4	e 1 44	?	—	—	e 7.5	8.9
Moncalieri	15.0	316	e 3 47	+8	6 43	+11	9.3	14.4
Algiers	15.8	282	3 51	+2	7 0	+10	9.2	13.7
Zurich	16.1	324	e 3 56	+3	e 7 5	+8	—	—
Barcelona	17.2	298	e 4 9	+2	e 7 40	+18	e 9.3	—
Besançon	17.3	320	e 4 37	+28	7 52?	+27	13.2	—
Strasbourg	17.4	326	4 10	0	7 25	-2	e 10.2	13.0
Tortosa	18.2	295	4 23	+4	7 48	+4	8.7	—
Tiflis	18.7	62	e 5 32	+67	e 9 8	+73	—	12.5
Königsberg	19.9	357	i 4 38	-2	8 13	-8	—	12.7
	19.9	357	—	—	8 19	-2	—	15.2
Paris	20.2	320	4 44	+1	8 29	+2	12.2	15.2
Hamburg	20.5	339	e 4 41	-6	e 8 43	+9	e 12.2	14.4
Uccle	20.5	326	e 4 46	-1	e 8 27	-7	e 11.2	—
De Bilt	21.1	329	4 57	+3	8 53	+7	11.7	15.1
Granada	21.1	284	i 4 51	-3	i 9 4	+18	i 13.7	18.4
Kew	23.2	322	—	—	—	—	—	19.2
Rio Tinto	23.5	285	10 14	?L	—	—	(10.2)	23.2
Oxford	23.8	322	5 22	-4	9 41	+1	—	16.0
Coimbra	24.9	291	e 5 23	-14	i 10 5	+4	e 13.9	—
Upsala	25.0	354	5 32	-6	10 0	-3	e 14.8	17.8
Bidston	25.7	324	6 1	+16	11 24	+68	—	17.3
Eskdalemuir	26.9	328	e 5 53	-4	10 27	-12	14.2	15.9
Edinburgh	27.2	328	—	—	e 10 14	-31	—	19.4
Dyce	27.7	331	—	—	e 10 43	-11	15.6	17.6
Cape Town	69.0	184	38 14	?L	—	—	(38.2)	—

Additional readings and notes: Athens gives also MN = +2.6m., T_0 = 16h.26m.43s. Belgrade PR₁ = +4m.18s., iSR₁ = +5m.17s. Vienna PR₂? = +4m.26s., S? = +8m.22s., SR₁? = +8m.57s. Lemberg readings have been diminished by 1h. Moncalieri MN = +11.4m. Strasbourg ePEN = +4m.14s., MN = +11.1m. Tiflis MN = +12.2m. Königsberg P is for Z component; the other readings are as entered. De Bilt MN = +12.6m. Coimbra SN = +10m.19s., T_0 = 16h.26m.15s. Upsala MN = +18.8m. Bidston alternative P = +8m.6s. Dyce iN = +11m.23s.

July 22d. Readings also at 3h. (Zi-ka-wei), 4h. (Manila, Colombo (2), Zi-ka-wei, and De Bilt), 8h. (La Paz), 12h. (Apia), 19h. (La Paz), 20h. (near Rocca di Papa and Pompeii).

July 23d. Readings at 4h. (near Granada), 7h. (near Rocca di Papa (2) and near Batavia), 8h. (Zi-ka-wei), 12h. and 15h. (Taihoku), 17h. (La Paz), 19h. (Tiflis), 20h. (Apia).

July 24d. Readings at 0h. (Coimbra and De Bilt), 1h. (Eskdalemuir), 6h. (Taihoku (2)), 12h. (La Paz), 13h. (Hong Kong and Taihoku), 16h. (Taihoku), 18h. (Algiers), 19h. (near Mizusawa).

July 25d. Readings at 3h. (Puebla and Colombo), 4h. and 7h. (Taihoku), 9h. (Batavia), 10h. (Bidston, Ottawa, and near Merida and Tacubaya), 13h. (Manila), 15h. (Taihoku), 16h. (near Zurich).

July 26d. 6h. 31m. 0s. Epicentre $50^{\circ}0'N$. $50^{\circ}0'W$.

$A = +.413$, $B = -.492$, $C = +.766$; $D = -.766$, $E = -.643$;

$G = +.492$, $H = -.587$, $K = -.643$.

Very rough.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Ottawa	17.8	265	e 4 14	- 1	e 7 37	+ 1	e 9.1	—
Washington	22.1	250	—	—	—	—	e 13.0	—
Chicago	27.1	267	—	—	e 11 15	+ 32	—	—
Eskdalemuir	28.3	61	—	—	—	—	13.0	—
Bidston	28.7	65	—	—	—	—	16.0	—
De Bilt	33.9	65	—	—	—	—	e 17.0	19.3

No additional readings.

July 26d. Readings also at 0h. (Malaga (2) and Granada (2)), 4h. (Melbourne and Wellington), 8h. (Taihoku and Adelaide), 10h. (Zi-ka-wei and Batavia (2)), 11h. (Zi-ka-wei), 16h. (La Paz), 20h. (Zante), 22h. (near Manila and near Tokyo).

July 27d. 3h. 0m. 54s. Epicentre $35^{\circ}5'N$. $2^{\circ}5'W$.

$A = +.813$, $B = -.036$, $C = +.581$; $D = -.044$, $E = -.999$;

$G = +.580$, $H = -.025$, $K = -.814$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Almeria	1.4	1	—	—	0 40	+ 1	—	—
Granada	1.9	332	i 0 25	- 4	—	—	—	—
Malaga	2.0	308	—	—	—	—	1.0	—
Alicante	3.2	30	1 10	+ 20	—	—	—	—
Tortosa	5.8	24	1 30	0	2 39	0	2.8	3.8
Coimbra	6.6	318	e 2 39	?S	3 21	?L	(3.4)	3.6

Coimbra gives also $MN = +3.7m.$, $T_0 = 3h.2m.18s.$

July 27d. Readings also at 2h. (Tiflis and Vienna), 5h. (Merida, Vera Cruz, Taihoku, and Oaxaca), 9h. (Lick), 10h. (Vera Cruz), 13h. (Apia), 15h. and 16h. (La Paz), 22h. (Taihoku), 23h. (Simla and Tacubaya).

July 28d. 8h. 0m. 0s. Epicentre 28°·5S. 71°·5W.

A = +·279, B = -·833, C = -·477 ; D = -·948, E = -·317 ;
G = -·151, H = +·453, K = -·879.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Andalgala	N.	4·7	80	1 48	+35	—	—	2·2	2·5
Mendoza		5·2	150	0 18	-62	—	—	0·9	2·4
Pilar		7·3	117	1 54	+ 3	(2 42)	-36	2·7	4·0
Cipolletti		10·8	166	4 48	?S	(4 48)	- 2	5·2	6·0
La Paz		12·4	15	3 6	+ 1	5 31	+ 2	6·4	8·1
Chacareta	E.	12·7	122	2 54	-15	—	—	4·0	4·2
	N.	12·7	122	2 54	-15	—	—	4·6	4·7
Coimbra		90·2	43	e 23 0	?	33 35	?	46·0	—
Eskdalemuir		102·0	33	—	—	—	—	50·0	—
Uccle		103·6	39	—	—	—	—	e 53·0	—
Strasbourg		104·4	43	—	—	—	—	e 50·0	—
De Bilt		104·6	38	—	—	e 29 48	+190	e 55·0	64·0

Additional readings: Andalgala gives also LE = +1·6m., ME = +2·9m.,
readings all increased by 3m. Pilar MN = +3·6m. Cipolletti readings
diminished by 4m. La Paz MN = +7·8m. De Bilt eLN = +57·0m.

July 28d. 23h. 43m. 0s. Epicentre 32°·5N. 42°·0W. (as on 1920 Sept. 17d.).

A = +·627, B = -·564, C = +·537 ; D = -·669, E = -·743 ;
G = +·399, H = -·360, K = -·843.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Coimbra		27·9	64	—	—	10 51	- 6	12·4	13·0
Tortosa	N.	34·4	63	—	—	—	—	e 14·0	16·6
Bidston		34·7	42	7 2	- 9	14 45	+114	(15·8)	18·0
Eskdalemuir		35·3	39	—	—	e 13 4	+ 4	14·8	—
Edinburgh		35·6	39	—	—	—	—	e 17·0	—
Dyce	N.	36·7	35	—	—	—	—	15·0	—
Uccle		38·3	48	—	—	e 13 44	+ 2	e 16·5	—
De Bilt		39·1	46	—	—	e 13 58	+ 5	e 16·9	18·2
Strasbourg		40·2	51	—	—	e 14 21	+11	e 18·0	—
Hamburg		42·2	43	—	—	—	—	e 19·0	20·0
Rocca di Papa		43·8	61	—	—	—	—	e 20·0	25·0

Additional readings: Coimbra gives also eE = +6m.50s., eN = +7m.50s.,
LN = +11·5m. Bidston alternative P = +7m.50s., the reading for L is
recorded as an alternative S. Dyce iN = +21m.0s. (?iL).

July 28d. Readings also at 7h. (Batavia, Manila, and Zi-ka-wei), 8h. (La Paz),
9h. (near Tokyo), 11h. (Tokyo, Zi-ka-wei, and near Mizusawa), 12h.
Uccle), 15h. (Zi-ka-wei), 16h. (La Paz), 18h. (Manila and Zi-ka-wei),
19h. (Colombo and De Bilt), 21h. (Taihoku), 22h. (Zagreb, Rocca di
Papa, and Pompeii).

July 29d. Readings at 3h. (near Tokyo), 9h. (La Paz, Mendoza, Pilar, and
Cipolletti), 10h. (Strasbourg), 13h. (Zi-ka-wei, Manila, and Batavia),
19h. (Nagasaki (2)), 20h. (Dehra Dun, Simla, Upsala, De Bilt, Honolulu,
Zagreb, Hamburg, Rocca di Papa, Apia, and Vienna).

July 30d. Readings at 6h. (La Paz), 9h. and 11h. (Taihoku) 16h. (Nagasaki (2)
and Zi-ka-wei), 23h. (La Paz).

July 31d. Readings at 2h. (near Merida and near Tortosa), 8h. (Batavia), 22h.
(Taihoku).

Aug. 1d. Readings at 0h. (Rocca di Papa and La Paz), 1h. (De Bilt and Strasbourg), 3h. (Taihoku), 6h. (Adelaide), 8h. (Zi-ka-wei), 12h. (Zi-ka-wei and near Mizusawa), 13h. and 14h. (Taihoku), 15h. (Taihoku and Moncalieri), 19h. (Taihoku), 21h. (Rocca di Papa), 22h. (near Tacubaya).

Aug. 2d. 6h. 10m. 45s. Epicentre $35^{\circ}5N$. $2^{\circ}5W$. (as on 1922 July 27d.).

$$A = +.813, B = -.036, C = +.581.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Granada	1.9	332	0 29	0	10 57	+ 4	11.1	1.4
Malaga	2.0	308	0 24	- 7	—	—	—	—
San Fernando	3.1	288	0 27	-22	—	—	—	0.7
De Bilt E.	17.4	16	—	—	—	—	e 10.0	—

Granada gives also MN = +1.2m.

Aug. 2d. 21h. 13m. 0s. Epicentre $43^{\circ}8N$. $11^{\circ}2E$. (Florence).

(as on 1922 April 7d.).

$$A = +.708, B = +.140, C = +.692; \quad D = +.194, E = -.981;$$

$$G = +.679, H = +.134, K = -.722.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 0	0	—	—	—	0.2
Padova	1.7	17	0 21	- 5	0 38	-10	0.7	—
Rocca di Papa	2.3	152	—	—	—	—	1.5	2.7
Moncalieri	2.8	295	e 0 50	+ 6	1 20	+ 3	—	—
Zagreb	4.0	58	e 1 14	+12	—	—	e 2.1	2.7
Zurich	4.0	332	e 0 48	-14	1 48	- 2	—	—

Zagreb gives also MNW = +2.3m.

Aug. 2d. Readings also at 1h. (Hong Kong, Lick, Zi-ka-wei, and Manila), 2h. (De Bilt, Uccle, and Bidston), 6h. (near Balboa Heights), 7h. (Dyce), 8h. (Kingston), 10h. (Algiers), 15h. (near Vera Cruz and Tacubaya).

Aug. 3d. 9h. 41m. 20s. Epicentre $18^{\circ}5S$. $168^{\circ}5E$.

$$A = -.929, B = +.189, C = -.317; \quad D = +.199, E = +.980;$$

$$G = +.311, H = -.063, K = -.948.$$

A focal depth of 0.020 below normal is assumed. The evidence for this is slight, but consistent: it is impossible to satisfy the observations at Melbourne, Batavia, and Zi-ka-wei without this assumption, to which 4 of the 6 antipodal stations lend fair support, though Pompeii and Granada are discordant.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$		m. s.	s.	m. s.	s.	m.	m.
Sydney	-0.9	21.8	222	9 40	? S	(9 40)	+58	12.2	12.9
Riverview	-0.9	21.8	222	e 5 1	+ 9	e 9 16	-34	e 10.9	—
Melbourne	-1.3	28.2	221	5 10	-47	10 22	-17	12.7	16.7
Adelaide	-1.4	31.2	233	—	—	e 11 40	+ 9	e 17.1	18.7
Honolulu	-2.2	51.6	42	—	—	—	—	e 23.7	—
Batavia	-2.4	61.2	274	10 12	+ 8	18 16	+ 7	—	—
Zi-ka-wei	-2.5	67.1	320	e 10 40	+ 2	—	—	(63.7)	66.7
Colombo	-2.8	90.9	277	63 40	? L ₁	—	—	e 67.7	82.8
De Bilt	—	144.0	341	e 22 46	? PR ₁	—	—	—	25.7
Zagreb	—	144.5	326	19 35	[-12]	—	—	—	85.7
Bidston	—	144.5	350	—	—	—	—	—	66.7
Uccle	—	145.3	341	—	—	—	—	—	73.7
Strasbourg	—	146.1	337	e 19 40	[-10]	e 22 57	? PR ₁	e 73.7	84.7
Zurich	—	146.8	334	e 19 37	[-14]	—	—	—	—
Pompeii	—	148.5	320	e 20 10	[-16]	—	—	—	—
Rocca di Papa	—	148.9	322	e 19 40	[-14]	—	—	—	—
Moncalieri	—	149.0	333	e 19 35	[-19]	—	—	—	—
Granada	—	160.1	341	20 29	[-21]	—	—	20.8	21.1

Additional readings and notes: Sydney P has been increased by 10m. Rocca di Papa gives also iP = +19m.46s. and +20m.10s. De Bilt eLN = +66.7m.

Aug. 3d. Readings also at 0h. (Moncalieri), 5h. (Mizusawa and near Athens), 8h. (Tiflis), 17h. (Zagreb and near Athens), 19h. (Algiers), 21h. (Zagreb (2), near Athens, and near Padova and Zurich).

Aug. 4d. Readings at 0h. (Colombo), 5h. (near Tacubaya), 9h. (Colombo), 10h. (De Bilt, Moncalieri, Rocca di Papa, Pompeii, and Strasbourg), 12h. (Zagreb), 14h. (Chicago, La Paz, and near Batavia), 18h. (Coimbra).

Aug. 5d. Readings at 2h. (near Osaka), 3h. (Coimbra), 4h. (Kew, De Bilt, Eskdalemuir, Strasbourg, Colombo, Zagreb, and Uccle), 6h. (near Batavia), 7h. (Colombo), 8h. (near Rocca di Papa), 10h. (Manila), 15h. (Taihoku), 16h. (Honolulu), 17h. (Taihoku), 23h. (La Paz).

Aug. 6d. 0h. 56m. 15s. Epicentre $35^{\circ}5'N$. $142^{\circ}0'E$.

$$A = -.642, B = +.501, C = +.581; \quad D = +.616, E = +.788; \\ G = -.458, H = +.358, K = -.814.$$

There are large discordances from this solution; possibly there were two shocks, but no means of reconciliation was found.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		m.	s.	m.	s.	m.	s.	m.	m.
Tokyo		1.9	276	-0 12	-41	0 13	-40	e 1.0	1.6
Mizusawa	E.	3.7	350	1 40	?8	(1 40)	-2	(3.1)	—
	N.	3.7	350	1 37	?8	(1 37)	-5	(3.2)	—
Osaka		5.4	263	1 23	0	—	—	3.7	5.1
Kobe		5.7	263	1 40	+12	2 30	-6	3.8	5.4
Nagasaki		10.5	258	e 0 32	-125	—	—	—	7.3
Zi-ka-wei		17.7	262	—	—	e 7 26	-7	—	12.9
Hong Kong		27.6	249	7 8?	+64	—	—	16.4	—
Manila		28.2	227	e 6 32	+22	—	—	12.8	—
Honolulu	E.	53.7	89	—	—	e 23 54	?	e 25.0	26.2
	N.	53.7	89	—	—	e 23 47	?	e 24.8	26.2
Tiflis		72.0	310	—	—	—	—	e 40.8	48.8
Konigsberg	N.	76.7	331	—	—	—	—	e 41.6	46.5
Hamburg		81.8	335	—	—	—	—	e 45.8	—
Dyce	N.	82.5	343	i 13 34	+61	i 24 34	+102	47.1	53.1
Vienna		83.2	329	—	—	—	—	e 49.0	58.8
Edinburgh		84.0	342	—	—	e 23 15	+7	—	57.8
Eskdalemuir		84.4	342	e 11 45	-59	e 22 20	-52	41.8	56.8
De Bilt		84.7	336	—	—	e 23 17	+1	e 45.8	55.8
Zagreb		85.2	326	e 11 45	-64	—	—	e 47.8	56.8
Uccle		86.0	336	—	—	e 23 15	-15	e 45.8	—
Bidston		86.1	340	15 10	?	24 25	+54	—	59.8
Strasbourg		86.7	332	e 13 0	+3	e 23 35	-3	23.8	—
Kew		87.0	339	—	—	—	—	—	53.8
Oxford		87.0	339	—	—	—	—	—	58.2
Paris		88.4	336	—	—	—	—	e 49.8	60.8
Rocca di Papa		89.9	325	—	—	—	—	e 55.2	60.2
Tortosa	N.	95.9	333	—	—	—	—	e 53.8	57.9
Coimbra		99.5	339	—	—	—	—	54.8	—
La Paz		147.1	63	20 0	[+ 9]	—	—	—	—

Additional readings: Osaka gives also $MN = +5.5m$. Kobe $MN = +4.9m$.
 Zi-ka-wei $MN = +11.9m$. Hong Kong P is doubtful. Tiflis $MN = +49.8m$.
 Eskdalemuir $MN = +54.8m$. De Bilt $MN = +52.2m$.
 Zagreb $MNW = +50.8m$. Rocca di Papa $L = +59.0m$. Tortosa
 readings are diminished by 1h. Coimbra $e = +45m.5s$.

Aug. 6d. 6h. 1m. 20s. Epicentre $34^{\circ}0'S$. $73^{\circ}0'W$. (as on 1922 May 21d.).

$A = +.242$, $B = -.793$, $C = -.559$; $D = -.956$, $E = -.292$;
 $G = -.163$, $H = +.535$, $K = -.829$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Mendoza	4.1	74	2 16	?S	(2 16)	+23	3.5	3.8
Cipolletti	6.3	143	(0 40)	-56	—	—	0.7	0.9
Pilar	8.0	76	2 10	+9	—	—	3.3	4.0
Andalgala	8.6	43	2 10	0	(4 4)	+11	4.9	5.9
Chacareta E.	12.1	97	3 34	+34	—	—	4.8	5.1
La Paz	18.0	15	e 4 13	-4	i 7 38	-2	9.6	11.8
Eskdalemuir	107.3	34	—	—	—	—	40.7	—
Uccle	108.6	41	—	—	—	—	—	58.7
De Bilt	109.7	41	—	—	—	—	e 45.7	47.6

Additional readings and notes: Pilar gives also $MN = +3.6m$. Andalgala
 $MN = +6.1m$, S is given as PN, and all readings are increased by 4m.
 Chacareta PN = +3m.28s.

Aug. 6d. Readings also at 1h. (La Paz and Zi-ka-wei), 20h. (Apia).

1922. Aug. 7d. 12h. 22m. 20s. Epicentre $1^{\circ}0'N$. $147^{\circ}0'E$.
 (as on 1919 April 22d.).

$A = -.839$, $B = +.545$, $C = +.017$; $D = +.545$, $E = +.839$;
 $G = -.015$, $H = +.010$, $K = -1.000$.

There may have been a second shock about 2 minutes later, recorded at Manila, Sydney, and Tokyo.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	29.1	300	e 8 52	+153	—	—	—	—
Riverview	35.0	174	e 6 46	-27	—	—	e 13.5	—
Sydney	35.0	174	10 10	+177	14 34	?SR ₁	18.0	21.4
Osaka	35.2	345	7 24	+9	—	—	—	15.8
Tokyo	35.4	350	e 9 42	+145	—	—	—	—
Adelaide	36.8	191	—	—	i 12 40	-41	e 18.8	20.5
Hong Kong	38.4	307	7 44	-3	(13 50)	+6	13.8	—
Zi-ka-wei	38.7	325	e 7 48	+4	c 13 58	+10	—	21.5
Melbourne	38.8	183	—	—	e 8 40?	?PR ₁	17.1	28.6
Batavia	40.7	262	9 24	?PR ₁	—	—	—	—
Perth	44.2	219	8 46	+19	14 57	-8	24.1	25.0
Honolulu E.	57.3	68	18 5	?S	(18 5)	+15	29.3	31.0
N.	57.3	68	18 30	?S	(18 30)	+40	28.2	31.7
Colombo	67.2	276	26 10	?L	—	—	(26.2)	30.2
Hamburg	114.8	334	e 17 40	?	—	—	62.7	—
Zagreb	116.1	324	e 20 10	?PR ₁	—	—	67.7	—
De Bilt	118.0	335	e 23 40	?	e 30 16	+102	e 62.7	—
Eskdalemuir	118.7	341	20 40	?PR ₁	e 30 26	+106	62.7	—
Strasbourg	119.2	330	e 20 40	?PR ₁	—	—	e 68.0	—
Uccle	119.2	334	—	—	—	—	—	62.7
Rocca di Papa	120.6	320	20 40	?PR ₁	—	—	e 77.2	—

Additional readings: Osaka gives also $MN = +16.0m$. Melbourne SR₁ =
 +12m.46s. Perth PR₁ = +10m.22s., SR₁ = +17m.36s. Honolulu
 PR₁N = +19m.50s., SN = +24m.20s., SR₁E = +26m.35s., SR₁N = +26m.18s.,
 T₀ = 12h.33m.28s. Eskdalemuir e = +23m.16s. and +26m.6s. Rocca
 di Papa PV = +22m.4s.

Aug. 7d. Readings also at 0h. (Manila), 1h. (La Paz and Wellington), 3h. (Tiflis),
 7h. (Rocca di Papa and Zagreb), 8h. (Hamburg, Strasbourg, and De Bilt),
 10h. (Zante, Rocca di Papa, and Zagreb), 13h. (near Tacubaya and near
 La Paz), 21h. (Batavia).

Aug. 8d. 3h. 49m. 6s. Epicentre 37°-5N. 23°-0E.

A = +.730, B = +.310, C = +.609; D = +.391, E = -.921;

G = +.560, H = +.238, K = -.793.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	0.7	51	i 0 13	+ 2	—	—	0.3	0.4
Mostar	7.0	328	e 0 44	-62	i 2 56	-14	—	3.5
Pompeii	7.3	299	e 2 9	+18	4 34	?L	(4.6)	—
Belgrade	7.5	347	e 1 58	+ 4	e 4 7	?L	(e 4.1)	5.2
Rocca di Papa	9.0	302	i 2 24	+ 8	5 30	?L	(5.5)	6.9
Zagreb N.E.	9.8	330	2 31	+ 4	i 4 58	?L	(i 5.0)	6.9
N.W.	9.8	330	2 29	+ 2	i 5 1	?L	(i 5.0)	6.7
Helwan	10.3	135	—	—	i 4 20	-17	—	4.9
Florence	10.9	309	2 25	-18	—	—	—	5.8
Padova	11.5	317	2 24	-28	7 40	?L	(7.7)	9.8
Vienna	11.5	338	e 2 57	+ 5	e 5 9	+ 2	—	10.9
Lemberg	12.3	3	e 3 24	+21	—	—	e 8.5	8.9
Innsbruck	13.0	323	—	—	—	—	e 10.9	—
Zurich	14.5	318	e 3 31	- 2	i 6 34	+14	—	—
N.	14.5	318	e 3 38	+ 5	e 6 35	+15	—	—
Strasbourg	15.6	320	3 54	+ 7	e 6 38	- 8	e 8.9	9.8
Besançon	15.8	313	e 3 57	+ 8	7 6	+16	9.9	—
Alziers	15.9	273	e 4 1	+10	7 7	+14	—	15.9
Tiflis	17.2	69	e 3 54	-13	e 7 11	-11	e 9.5	11.3
Königsberg	17.4	355	i 4 9	- 1	e 7 21	- 6	e 9.9	11.2
Tortosa	17.7	286	4 21	+ 8	7 50	+17	9.7	12.9
Hamburg	18.5	335	i 4 23	0	e 8 6	-15	e 10.7	15.0
Paris	18.6	314	e 4 29	+ 5	e 7 5	-48	10.9	—
Uccle	18.8	321	e 4 28	+ 1	e 8 0	+ 2	10.1	—
De Bilt	19.2	325	4 37	+ 6	8 12	+ 6	10.4	13.4
Granada	21.1	277	e 5 5	+11	9 1	+15	e 13.9	17.7
Kew	21.5	318	—	—	—	—	—	15.9
Oxford	22.2	318	i 5 5	- 2	i 9 9	0	12.4	15.2
Upsala	22.6	354	e 5 6	- 6	e 9 17	0	13.0	14.2
West Bromwich	23.0	319	e 5 12	- 5	9 22	- 3	—	15.5
Stonyhurst	23.9	321	—	—	9 42	0	13.9	16.9
Bidston	24.0	320	6 27	+59	10 44	+60	—	17.2
Coimbra	24.5	286	5 33	0	9 55	+ 1	e 14.2	—
Eskdalemuir	25.1	324	5 36	- 3	10 4	- 1	12.7	16.9
Edinburgh	25.4	325	5 36	- 6	10 12	+ 1	—	18.1
Dyce N.	25.7	328	5 33	-12	9 13	-63	—	15.0

Additional readings: Mostar gives also iP = +1m.37s. Belgrade iP = +2m.23s., MN = +5.8m. Zagreb eNW = +3m.19s., eNE = +3m.37s. Padova MN = +8.8m. Vienna S is given as e simply. Also iS? = +7m.2s., iSR,? = +7m.58s. Zurich iN = +3m.43s. Strasbourg MN = +11.8m. Tiflis MN = +12.9m. Königsberg SN = +7m.28s., PS = +7m.36s., MN = +12.0m. Hamburg MN = +13.8m. De Bilt MN = +13.1m., T₀ = 3h.49m.15s. Granada i = +5m.47s. and +5m.59s. Upsala MN = +15.4m. Coimbra eLN = +13.4m., T₀ = 3h.49m.10s.

Aug. 8d. Readings also at 2h. (near Athens), 6h. (Tacubaya), 7h., 8h., and 10h. (near Athens), 11h. (La Paz and near Athens), 12h. (Coimbra), 14h. (Zi-ka-wei, Calcutta, and near Athens), 15h. (De Bilt and near Athens), 21h. (near Osaka), 22h. (Barcelona and near Tortosa).

Aug. 9d. Readings at 0h. (Tiflis), 1h. (near Tacubaya), 3h. (Colombo and Batavia), 6h. (Manila, Batavia, and Zi-ka-wei), 9h. (near Tokyo and near Padova), Innsbruck, and Zurich), 10h. (Zurich and near Tacubaya (2)), 16h. (La Paz), 17h. (Ottawa), 19h. and 21h. (Athens).

Aug. 10d. Readings at 0h. (Athens), 6h. (La Paz and Eskdalemuir), 9h. (Athens), 10h. (near Tacubaya), 11h. (Athens, Batavia (2), and near Manila), 14h. (Tiflis), 16h. (Athens), 17h. (Athens and near Mizusawa), 20h. (near Manila), 23h. (Athens).

1922. Aug. 11d. 8h. 19m. 36s. Epicentre 36°0N. 28°0E.

(as on 1921 Jan. 27d.).

A = +.714, B = +.380, C = +.588; D = +.470, E = -.883;

G = +.519, H = +.276, K = -.809.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Athens		3.9	302	e 1 3	+ 2	2 7	+20	2.2	2.4
Helwan		6.7	154	1 37	- 5	i 2 47	-15	—	11.5
Belgrade		10.5	329	e 2 32	- 5	i 4 23	-20	—	7.6
Mostar		10.7	316	e 2 51	+11	(e 4 15)	-33	(e 6.6)	8.1
Pompeii		11.6	298	e 3 0	+ 7	5 30	+21	7.4	8.9
Rocca di Papa	E.	13.2	301	e 3 6	-10	5 42	- 7	i 7.1	—
	N.	13.2	301	e 3 0	-16	—	—	i 7.4	10.2
Zagreb	N.E.	13.3	321	3 19	+ 2	i 6 3	+12	—	8.0
	N.W.	13.3	321	—	—	i 6 6	+15	—	8.9
Lemberg		14.1	350	e 3 48	+21	e 6 42	+32	e 8.1	9.7
Florence		15.0	306	3 24	-15	6 29	- 3	—	9.7
Vienna		15.0	329	i 3 45	- 6	i 6 48	+16	—	9.9
Padova		15.4	312	3 44	0	6 54	+13	—	11.9
Innsbruck		16.7	318	i 4 4	+ 3	e 7 16	+ 5	8.7	9.7
Zurich	E.	18.3	314	4 20	- 1	7 47	0	—	—
Marseilles		18.8	300	4 24	- 3	i 8 3	+ 5	9.9	10.7
Strasbourg		19.4	317	4 34	0	8 15	+ 5	e 10.4	11.6
Konigsberg	Z.	19.5	347	4 38	+ 3	8 32	+19	e 9.7	13.2
Besancon		19.8	312	e 4 43	+ 4	8 23	+ 4	10.4	—
Algiers		20.0	280	i 4 36	- 5	8 9	-14	9.4	12.9
Barcelona		20.8	293	i 4 45	- 6	i 8 35	- 5	e 10.5	—
Puy de Dome		21.2	306	5 4	+ 9	9 4	+16	11.9	—
Hamburg		21.6	330	e 4 59	- 1	e 8 59	+ 2	11.6	15.9
Tortosa	N.	22.0	291	4 54	-11	8 54	-11	9.6	14.0
Uccle		22.5	318	e 5 6	- 5	i 9 10	- 5	10.4	12.3
Paris		22.6	313	e 5 8	- 4	i 9 14	- 3	12.0	12.4
De Bilt		22.8	322	5 11	- 4	9 23	+ 2	10.0	15.7
Upsala		24.8	348	5 32	- 4	9 57	- 2	e 12.8	16.7
Granada		25.3	282	i 5 45	+ 4	i 10 4	- 5	i 14.8	19.6
Kew		25.3	316	10 24	?S	(10 24)	+15	—	16.4
Oxford		26.1	317	5 40	- 9	10 13	-11	12.6	16.7
West Bromwich		26.8	318	6 9	+13	10 19	-18	—	17.4
San Fernando		27.5	281	6 12	- 9	10 24	-26	—	20.2
Rio Tinto		27.6	284	12 24	?L	—	—	(12.4)	22.4
Stonyhurst		27.6	320	6 42	+38	10 42	-10	15.5	16.1
Bidston		27.8	319	7 44	+98	11 29	+34	—	18.2
Bergen		28.4	336	8 24	?	—	—	17.4	—
Eskdalemuir		28.7	322	5 54	-21	10 48	-24	13.4	16.5
Coimbra	E.	28.8	290	e 6 12	- 4	i 10 52	-21	e 17.6	18.2
	N.	28.8	290	—	—	—	—	15.1	19.0
Edinburgh		29.0	323	e 6 57	+39	11 32	+15	—	17.7
Dyce	N.	29.2	326	5 50	-30	10 15	-65	14.3	20.6
Simla	E.	40.8	81	e 14 12	?S	(e 14 12)	- 6	—	—
Kodaikanal		51.5	107	16 36	?S	(16 36)	- 2	27.8	39.1
Colombo		55.5	109	12 54	?PR ₁	22 54	?SR ₁	32.9	38.4
Johannesburg		62.2	180	—	—	—	—	32.4	—
Capetown		70.5	188	32 24	?L	37 24	?	(32.4)	38.9
Ottawa		73.6	315	e 11 42	+ 2	i 21 20	+11	e 34.4	—
Zi-ka-wei		74.7	62	e 12 0	+13	—	—	—	74.7
Ithaca		75.7	312	—	—	i 21 35	+ 1	e 38.4	—
Toronto		76.6	315	—	—	—	—	e 39.1	44.6
Georgetown		78.1	310	e 11 51	-17	i 22 16	+15	—	—
Washington		78.1	310	—	—	23 8	+67	38.4	—
Ann Arbor		80.0	316	e 11 12	-67	i 22 18	- 5	38.4	—
Chicago		82.1	318	12 55	+24	22 41	- 6	36.9	—
Manila		83.8	77	—	—	e 21 24	-103	—	—
Batavia		84.7	102	—	—	e 23 1	-15	—	—
Victoria		91.8	341	—	—	—	—	47.9	55.8
La Paz		104.5	260	e 22 35	?	24 41	-117	54.9	58.7
Mendoza		113.3	244	59 54	?L	—	—	66.3	72.9
Cipolletti		115.9	239	64 12	?L	—	—	70.8	71.8

Additional readings: Athens gives also i - 1m.7s. and - 1m.19s. Belgrade
 iP = +3m.58s. Mostar eS is given as a second eP, and eL as eS. Zagreb
 iNE = +3m.50s. and +5m.15s., iNW = +3m.51s. and +5m.19s. Vienna
 PN = +3m.46s., iSEN = +8m.30s., iS is given as i simply. Konigsberg
 PN = +4m.40s., PE = +4m.43s., iZ = +5m.18s., ME = +12.6m., MN =
 +14.2m. Hamburg MNZ = +15.1m. Uccle MN = +13.3m. De Bilt
 MN = +13.4m. Upsala MN = +17.4m. San Fernando MN = +17.7m.
 Bergen P has been increased by 10m. Coimbra iE = +11m.16s., iN =
 +13m.14s., T₀ = 8h.19m.55s. Simla ePN = +14m.24s. (O - C = +6s.).
 Colombo S = +25m.54s., L = +35.9m. La Paz first two readings given as
 eP? and P?.

Aug. 11d. 1909. Epicentre 55°-0N. 167°-0E.

A = +129, B = +129, C = -19, D = +225, E = +974;
G = -798, H = +184, K = -574.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Oo'omati		17.3	251	4 17	- 8	—	—	9.2	10.4
Mizusawa	E.	23.5	238	5 23	0	9 36	+ 1	—	—
Tokyo		26.9	235	e 4 0	-117	(e 10 44)	+ 5	e 10.7	—
Kobe		29.9	241	e 9 57	?S	(9 57)	-95	—	15.6
Sitka	E.	31.3	63	—	—	—	—	e 17.4	11.6
	N.	31.3	63	—	—	—	—	e 18.2	19.4
Zi-ka-wei		39.9	254	e 7 38	-16	—	—	—	26.1
Victoria		41.9	69	14 14	?S	(14 14)	-20	21.2	24.2
Honolulu	E.	42.6	129	—	—	14 45	+ 2	17.9	19.5
Berkeley	E.	49.2	80	—	—	—	—	e 25.0	—
Hong Kong		50.8	250	16 30	?S	(16 30)	+ 1	—	—
Manila		53.7	240	e 10 0	+29	—	—	—	—
Upsala		62.6	344	e 10 25	- 4	e 18 50	- 6	e 35.7	39.0
Chicago		64.4	54	18 40	?S	(18 40)	-38	35.0	—
Simla	N.	64.8	289	—	—	—	—	e 33.4	—
Ann Arbor		65.7	50	—	—	i 19 42	+ 9	35.0	—
Ottawa		66.5	44	—	—	e 19 45	+ 1	41.0	—
Toronto		66.5	47	19 42	?S	(19 42)	- 2	e 35.3	38.5
Konigsberg		66.8	340	—	—	(e 19 49)	+ 1	e 19.8	39.0
Dyce	N.	67.4	355	10 51	- 9	19 6	-49	31.1	—
Ithaca		68.7	46	19 37	?S	(19 37)	-33	36.0	—
Edinburgh		68.8	355	—	—	i 20 18	+ 6	—	—
Eskdalemuir		69.4	355	e 11 16	+ 3	20 19	0	32.5	38.1
Hamburg		69.8	347	e 12 0	+44	i 20 30	+ 6	e 36.0	53.0
Bidston		71.3	354	12 20	- 5	21 40	+58	—	45.0
Georgetown	E.	71.4	48	—	—	—	—	39.7	—
Tiflis		71.6	319	—	—	e 20 30	-15	e 34.3	42.5
De Bilt	E.	71.8	349	—	—	20 51	+ 3	e 33.0	58.2
	N.	71.8	349	e 11 30	+ 2	20 50	+ 2	e 38.0	59.5
Oxford		72.8	354	11 40	+ 5	i 21 0	0	40.0	57.5
Kew		73.0	354	—	—	—	—	—	70.0
Uccle		73.2	350	e 11 30	- 7	e 21 3	- 1	e 37.0	41.0
Vienna		73.8	340	i 11 50	+ 9	21 16	+ 4	e 43.0	51.0
Strasbourg		75.0	347	e 12 0	+11	—	—	37.0	—
Paris		75.4	351	e 12 21	+30	e 21 29	- 1	e 39.0	49.0
Zagreb		76.3	340	e 12 0	+ 3	21 40	- 1	e 34.0	47.0
Batavia		78.7	241	-0 13	?	—	—	—	—
Rocca di Papa		80.8	341	12 18	- 6	22 24	- 9	e 47.9	58.1
Pompeii		81.4	340	e 13 46	+79	—	—	—	—
Kodaikanal		81.4	275	45 18	?L	—	—	(45.3)	—
Colombo		82.7	272	47 30	?L	—	—	(47.5)	53.0
Tortosa	N.	83.5	350	12 47	+ 8	22 55	- 8	e 40.0	57.2
Coimbra		84.8	357	—	—	e 28 0	?SR ₁	e 42.0	—
Algiers		87.2	348	e 12 54	- 6	23 34	- 9	—	60.0
Granada		87.5	354	13 38	+36	23 50	+ 3	e 48.0	51.7
Riverview		89.9	192	—	—	e 37 19	?	e 43.1	—

Additional readings and notes : Mizusawa gives also PN = +5m.22s. Kobe
MN = +15.1m. Victoria S = +17m.43s. Honolulu LN = +18.0m.
MN = +19.6m. Berkeley eE = +20m.0s., eN = +21m.42s. Chicago
S? = +25m.33s. Simla eE = +27m.24s. Ann Arbor iN = +19m.0s.
Toronto S = +27m.30s., eL = +42.5m., and +48.8m. Ithaca eN =
+21m.5s., S?N = +28m.25s. Eskdalemuir e = +25m.0s., MN = +36.5m.
Hamburg MN = +31.0m. Bidston S = +18m.28s. Georgetown eE =
+18m.0s., eN = +18m.29s., LN = +43.6m. Tiflis e = +15m.0s., +
+16m.24s., +21m.24s., and +25m.6s., MN = +49.9m. Zagreb MNW =
+45.6m. Rocca di Papa iL = +52.1m.

Aug. 11d. Readings also at 3h. (Taihoku), 6h. (Mendoza), 8h. (near Athens),
9h. (Riverview, near Tokyo, and Mizusawa), 10h. (De Bilt, Vienna,
Strasbourg, Rocca di Papa, Hamburg, Zagreb, and near Athens), 11h.
(Tiflis, De Bilt, and Uccle), 17h. (near Athens), 19h. (Manila and Batavia),
21h. (Lick), 22h. (Granada).

Aug. 12d. Readings at 0h. (Granada), 10h. (near Tacubaya (2)), 12h. (near
Athens and near Nagasaki), 14h. (Athens), 19h. (Zagreb and near Bel-
grade), 20h. (Rocca di Papa), 22h. (La Paz).

1922. Aug. 13d. 0h. 9m. 50s. Epicentre 36°0N. 28°0E.

(as on Aug. 11d.; but see Note at end).

 $A = +.714, B = +.380, C = +.588; D = +.470, E = -.883;$ $G = +.519, H = +.276, K = -.809.$

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Athens		3.9	302	e 1 6	+ 5	i 1 54	+ 7	—	4.3
Helwan		6.7	154	i 1 38	- 4	i 2 49	-13	—	9.2
Belgrade		10.5	329	i 2 42	+ 5	i 4 45	+ 2	—	7.0
Mostar		10.7	316	i 2 36	- 4	5 5	+17	—	7.6
Pompeii		11.6	298	e 2 55	+ 2	4 0	?	6.2	12.2
Rocca di Papa		13.2	301	e 3 10	- 6	i 5 40	- 9	—	5.9
Zagreb	N.E.	13.3	321	e 3 22	+ 5	i 5 57	+ 6	—	8.1
	N.W.	13.3	321	e 3 17	0	i 5 52	+ 1	—	10.0
Lemberg		14.1	350	e 3 43	+16	e 6 38	+28	e 8.1	9.7
Florence		15.0	306	3 40	+ 1	6 17	-15	—	10.7
Vienna		15.0	329	i 3 40	+ 1	i 6 33	+ 1	i 8.0	—
Padova		15.4	312	3 48	+ 4	(6 17)	-24	(7.5)	9.0
Innsbruck		16.7	318	i 4 5	+ 4	i 7 17	+ 6	e 9.0	9.8
Zurich		18.3	314	e 4 21	0	i 7 42	- 5	10.0	—
Marseilles		18.8	300	4 29	+ 2	i 7 52	- 6	9.7	10.2
Strasbourg		19.4	317	4 31	- 3	e 8 6	- 4	9.8	11.6
Königsberg		19.5	347	4 35	0	8 16	+ 3	e 10.0	12.1
Besançon		19.8	312	e 4 35	- 4	i 8 17	- 2	11.2	—
Algiers		20.0	280	i 4 36	- 5	8 8	-15	9.7	13.7
Barcelona		20.8	293	4 46	- 5	i 8 38	- 2	e 10.4	12.8
Hamburg		21.6	330	e 4 57	- 3	e 8 46	-11	e 11.6	13.2
Tortosa	N.	22.0	291	4 54	-11	i 8 46	-19	9.6	14.1
Uccle		22.5	318	e 4 59	-12	i 9 8	- 7	i 10.2	17.2
Paris		22.6	313	e 5 9	- 3	i 9 9	- 8	e 11.7	15.2
De Bilt		22.8	322	e 5 9	- 6	9 17	- 4	10.1	15.7
Upsala		24.8	348	i 5 29	- 7	i 9 55	- 4	e 13.3	17.1
Kew		25.3	316	9 10	?S	(9 10)	-59	—	15.2
Granada		25.3	282	i 5 37	- 4	i 10 3	- 6	15.7	19.5
Oxford		26.1	317	5 39	-10	10 12	-12	13.2	16.7
San Fernando		27.5	281	5 55	- 8	11 52	+62	—	20.9
Rio Tinto		27.6	284	11 10	?S	(11 10)	+18	—	23.2
Stonyhurst		27.6	320	6 4	0	11 16	+24	15.7	16.4
Bergen		28.4	336	e 6 10	- 2	—	—	—	—
Eskdalemuir		28.7	322	e 6 7	- 8	i 10 47	-25	13.2	23.2
Coimbra	E.	28.8	290	—	—	i 11 18	+ 5	e 16.2	18.2
	N.	28.8	290	6 11	+ 5	10 53	-20	14.7	18.9
Edinburgh		29.0	323	6 13	- 5	11 1	-16	12.2	17.0
Dyce		29.2	326	e 5 47	-33	10 56	-24	13.0	15.8
Simla	E.	40.8	81	7 40	-21	13 46	-32	22.7	—
	N.	40.8	81	10 34	?PR ₁	—	—	24.2	—
Dehra Dun		41.8	82	7 10	-59	—	—	—	—
Azores		42.4	288	14 22	?S	(14 22)	-18	—	29.9
Bombay		42.8	100	7 25	-52	—	—	—	—
Kodaikanal		51.5	107	15 16	?S	(15 16)	-82	31.5	38.7
Calcutta	E.	53.4	87	9 16	-13	16 52	- 9	25.5	—
	N.	53.4	87	9 14	-15	16 45	-16	—	—
Colombo		55.5	109	10 10	+27	26 52?	?L	35.5	39.2
Johannesburg		62.2	180	—	—	—	—	31.2	33.9
Capetown		70.5	188	—	—	20 14	-18	38.1	38.8
Northfield		72.4	314	—	—	20 44	-11	38.2	—
Ottawa		73.6	315	11 40	0	21 10	+ 1	35.2	—
Hong Kong		74.1	75	—	—	21 25	+10	—	—
Ithaca		75.7	312	—	—	e 21 33	- 1	e 36.2	—
Toronto		76.6	315	—	—	21 16	-28	e 34.1	47.9
Georgetown		78.1	310	11 26	-42	i 22 5	+ 4	e 35.5	—
Washington		78.1	310	—	—	23 0	+59	e 38.2	—
Taihoku		78.2	69	—	—	e 22 10	+ 8	—	—
Ann Arbor		80.0	316	12 10	- 9	i 22 4	-19	48.5	—
Kobe	E.	82.0	52	—	—	—	—	—	52.2
Chicago		82.1	318	12 47	+16	22 43	- 4	35.2	—
Osaka		82.2	52	11 39	-52	—	—	—	25.4
Manila		83.8	77	e 12 50	+ 9	23 16	+ 9	42.2	45.8
Tokyo		84.3	50	12 30	-14	(e 22 25)	-46	e 22.4	25.5
Batavia		84.7	102	e 12 35	-11	i 22 57	-19	e 65.2	—
Sitka	E.	85.9	351	—	—	—	—	e 42.2	45.3
	N.	85.9	351	—	—	—	—	e 43.0	53.4

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Victoria	91.8	341	25 24	?S	(25 24)	+51	e 47.7	54.8
Lick	E. 101.2	336	—	—	—	—	e 58.5	—
Berkeley	E. 101.2	337	—	—	e 38 52	?	e 53.2	57.0
La Paz	104.5	260	18 26	?PR ₁	28 48	+130	47.5	56.0
Perth	106.6	118	—	—	—	—	54.4	—
Andalgala	E. 109.1	248	—	—	—	—	59.8	63.3
	N. 109.1	248	30 10	?	—	—	53.5	64.9
Pilar	109.4	243	34 40	?	—	—	56.6	76.1
Mendoza	113.3	244	30 22	?	—	—	60.6	75.7
Cipolletti	115.9	239	39 58	?	—	—	59.4	73.1
Honolulu	N. 122.4	6	—	—	—	—	e 55.2	73.4
Adelaide	124.7	110	—	—	e 27 10?	-134	i 74.0	83.7
Melbourne	130.5	111	—	—	e 31 10	?	e 73.0	84.8
Riverview	134.0	103	—	—	e 41 25	?SR ₁	e 60.7	—

Additional readings: Athens gives also $i = +1m.13s.$, $iP = +1m.17s.$, $i = +1m.30s.$, $MN = +2.5m.$, $T_0 = 0h.9m.56s.$ Belgrade $iP = +3m.38s.$, $MN = +9.3m.$ Mostar $iP = +2m.46s.$ Rocca di Papa $e = +3m.4s.$, $i = +3m.16s.$ Zagreb $iNE = +4m.4s.$ and $+4m.29s.$, $iNW = +4m.32s.$ Vienna gives very many i readings, also $iSEZ = +6m.38s.$, $iLN = +7.9m.$, $iLZ = +9.6m.$ Padova $PR_1 = +5m.17s.$, $SR_1 = +7m.17s.$ Zurich $i = +5m.6s.$ Strasbourg $PN = +4m.34s.$ ($O-C = 0s.$), $MN = +12.2m.$, $MZ = +12.7m.$ Königsberg $iEN = +5m.37s.$, $SZ = +8m.18s.$, $MN = +13.1m.$, $MZ = +13.2m.$ Algiers $MN = +15.7m.$ Barcelona $PR_1 = +5m.14s.$, $MN = +12.0m.$ Hamburg $MN = +15.4m.$, $MZ = +15.0m.$ Uccle $iP = +5m.5s.$, $MN = +13.3m.$ Paris $MN = +12.2m.$ De Bilt $i = +5m.19s.$, $MN = +13.4m.$ Upsala $MN = +17.2m.$ Granada $MN = +18.4m.$ San Fernando $MN = +17.7m.$ Rio Tinto readings are given as for 12d.0h. Eskdalemuir $MN = +14.4m.$ Coimbra $iN = +13m.13s.$, $T_0 = 0h.10m.5s.$ Johannesburg readings given as for 12d. Ithaca $eS? = +22m.34s.$ Toronto $e = +13m.34s.$ and $+16m.10s.$, $eL = +47.3m.$, $+77.4m.$, and $+94.0m.$ Georgetown $LEN = +38.2m.$ Ann Arbor $L = +38.2m.$ Kobe $MN = +51.6m.$ Manila $MN = +46.6m.$ Tokyo $MN = +24.6m.$ Batavia $i = +14m.14s.$ and $+19m.52s.$ Sitka $eLN = +52.1m.$ Victoria $L = +39.9m.$, $eL = +51.9m.$ Pilar $MN = +66.7m.$ Mendoza readings diminished by 4h. Honolulu $eE = +52m.10s.$ Adelaide gives also a large number of e readings.

COMPARISON OF AUGUST 13d.0h. AND AUGUST 11d.8h.

So many stations record both these shocks that a direct comparison is interesting. Omitting large residuals, and retaining only good determinations of P and S on both occasions, differences in the sense August 13—August 11 are as below:—

Δ	Az.	P.	S.	Δ	Az.	P.	S.	Δ	Az.	P.	S.
$^{\circ}$	$^{\circ}$	s.	s.	$^{\circ}$	$^{\circ}$	s.	s.	$^{\circ}$	$^{\circ}$	s.	s.
20.0	280	0	-1	19.8	312	-8	-6	13.3	321	0	-11
25.3	282	-8	-1	22.6	313	+1	-5	28.7	322	+13	-1
28.8	290	+9	+14	18.3	314	+1	-5	22.8	322	-2	-6
22.0	291	0	-13	73.6	315	-2	-10	10.5	329	+10	+22
20.8	293	+1	+3	26.1	317	-1	-1	15.0	329	-5	-15
18.8	300	+5	-11	19.4	317	-3	-9	21.6	330	-2	-13
13.2	301	+7	-2	16.7	318	+5	+1	19.5	347	-3	-16
3.9	302	+3	-13	22.5	318	-7	-2	24.8	348	-3	-2
15.0	306	+16	-12	82.1	318	-8	+2	14.1	350	-5	-4
18.6	294	+4	-4	33.5	316	-2	-4	18.9	333	0	-5

The P differences are nearly zero in the mean, but the S differences are consistently negative. Let us suppose that this indicates a change in epicentre. The mean Δ is 23 and $S-P = -5s.$ Hence we should have (taking August 11 as the standard) for August 13

$$\delta \Delta = -0.6 \quad \delta P = -7s. \quad \delta S = -12s.$$

the displacement being in azimuth 315 or NW. If the epicentre is thus adjusted the residuals for P will all be increased by 7s., and being zero before will now be +7; those for S (-5s. before) will be increased by +12s., and become +7s. as for P . This 7 sec. must be thrown on the T_0 either of Aug. 11 or Aug. 13. But on re-examination of the residuals for correction to T_0 in both cases the adopted determination was found closely correct. It seems therefore more probable that the differences are accidental. The mean numerical difference for P is $\pm 1.7s.$, and for S $\pm 7.4s.$

COMPARISON OF AUG. 13d.0h. AND AUG. 13d.12h.

Making a similar direct comparison for the 2 earthquakes on Aug. 13, the means of 18 accordant determinations are for 12h. - 0h.: $\delta P = +4.6s.$, $\delta S = +5.2s.$ Here no sensible change in epicentre is indicated, but suspicion is thrown on the T_0 . On recalculating that for Aug. 13d. 12h. a correction of $+2.5s.$ was found which would reduce the above discordances by one half. Hence the T_0 for Aug. 13d.12h. should probably be 12h.46s.3s. at least. But as regards the epicentres for the three shocks, they seem to be closely the same, within a small fraction of 1° .

Aug. 13d. 12h. 46m. 0s. Epicentre $36^\circ.0N.$ $28^\circ.0E.$ (as at 0h.).

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^\circ$	$^\circ$	m. s.	s.	m. s.	s.	m.	m.
Athens	3.9	302	e 1 8	+ 7	1 56	+ 9	2.1	2.3
Helwan	6.7	154	1 44	- 2	2 50	- 12	—	5.8
Belgrade	10.5	329	i 2 40	+ 3	i 4 49	+ 6	—	6.5
Rocca di Papa	13.2	301	i 3 12	- 4	e 7 24	?L	e 9.2	12.6
Zagreb	13.3	321	e 3 27	+10	i 6 6	+15	—	8.1
N.E.	13.3	321	e 3 21	- 4	—	—	—	10.0
N.W.	14.1	350	3 54	+27	e 6 54	+44	e 9.3	9.7
Lemberg	14.2	61	e 4 0	+31	e 7 0	+47	—	11.6
Tiflis	15.0	329	3 41	+ 2	6 39	+ 7	e 7.5	11.0
Vienna	15.0	306	5 35	?	8 0	?L	(8.0)	9.7
Florence	15.4	312	4 0	+16	(7 7)	+26	—	10.0
Padova	16.7	318	i 4 5	- 4	e 7 15	- 4	e 9.6	9.9
Innsbruck	18.3	314	e 4 21	0	e 7 48	+ 1	—	—
Zurich	18.8	300	4 33	- 6	8 0	+ 2	10.0	11.0
Marseilles	19.4	317	4 35	+ 1	8 9	- 1	e 9.0	14.7
Strasbourg	19.5	347	i 3 40	-5.5	8 19	+ 6	e 11.0	14.2
Konigsberg	19.8	312	e 4 34?	- 5	8 18	- 1	11.0	—
Besançon	20.0	280	4 36	- 5	8 13	-10	—	17.0
Algiers	20.8	293	e 4 54	+ 3	e 8 37	- 3	e 10.8	16.3
Barcelona	21.6	330	e 4 59	- 1	—	—	e 10.5	13.4
Hamburg	22.0	291	5 0	- 5	8 58	- 7	—	16.3
Tortosa	22.5	318	e 5 7	- 4	9 13	- 2	e 11.5	13.2
Uccle	22.6	313	e 5 13	+ 1	e 9 15	- 2	e 13.0	—
Paris	22.8	322	e 5 59	+44	9 20	- 1	9.9	15.8
De Bilt	24.8	348	e 5 32	- 4	e 10 1	+ 2	e 13.5	16.8
Upsala	25.3	316	10 0	?S	(10 0)	- 9	—	15.0
Kew	25.3	282	5 49	+ 8	10 3	- 6	—	—
Granada	26.1	317	5 49	0	10 24	0	15.0	16.7
Oxford	27.6	320	e 3 30	?	5 0	?P	—	16.5
Stonyhurst	27.8	319	—	—	—	—	14.0	—
Bidston	28.7	322	e 7 0	+45	e 10 5.5	-17	14.0	16.6
Eskdalemuir	28.8	290	—	—	—	—	15.0	21.5
Coimbra	29.0	323	—	—	e 11 31	+14	—	21.5
Edinburgh	29.2	326	i 7 35	+75	i 11 5	-15	13.2	16.0
Dyce	51.5	107	29 36	?L	—	—	(29.6)	—
Kodaikanal	55.5	109	27 0	?L	33 0	?	(27.0)	38.0
Colombo	70.5	188	39 10	?L	—	—	(39.2)	—
Cape Town								

Additional readings: Athens gives also MN = +2.5m. Belgrade iP = +3m.25s. Rocca di Papa eP = +3m.42s. Zagreb iNE = +4m.20s. Tiflis S is given as e, also MN = +13.5m. Strasbourg MN = +11.7m. Hamburg MN = +14.3m., MZ = +16.6m. De Bilt P is given as e, also MN = +13.4m. Upsala MN = +17.4m. Coimbra MN = +20.0m. Dyce readings all given as i simply, also i = +12m.0s. Colombo L = +35.5m.

Aug. 13d. Readings also at 1h. (Zi-ka-wei and near Tacubaya), 2h. (Uccle), 3h. (Eskdalemuir, Rocca di Papa, Vienna, and near Athens (2)), 8h. (near Athens), 11h. (Tiflis), 17h. (near Athens), 19h. (near Port au Prince), 22h. (La Paz).

Aug. 14d. 11h. 41m. 8s. Epicentre $52^{\circ}0'N$. $131^{\circ}5'E$.

$$A = -.408, B = +.461, C = +.788; \quad D = +.749, E = +.663; \\ G = -.522, H = +.590, K = -.616.$$

A depth of focus 0.010 is assumed; but see note at end.

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ootomari		-0.1	9.0	122	2 25	+10	(4 3)	+2	4.0	4.1
Mizusawa	E.	-0.2	14.5	149	3 27	-3	6 10	-5	—	—
	N.	-0.2	14.5	149	3 26	-4	6 8	-7	—	—
Nagoya		-0.3	17.3	165	4 6	+1	—	—	—	—
Tokyo		-0.3	17.4	157	4 4	-2	(e 7 8)	-12	e 7.1	8.4
Zi-ka-wei		-0.4	22.1	204	e 5 47	+46	e 10 19	+80	—	—
Taihoku		-0.6	28.0	199	—	—	—	—	e 20.2	—
Manila		-0.8	38.4	196	e 7 45	+10	(13 54)	+22	13.9	—
Upsala		-1.1	56.2	326	9 38	-2	i 17 21	-1	—	—
Tiflis		-1.1	56.6	297	e 9 58	+15	e 18 52	+84	—	27.2
Konigsberg		-1.2	58.8	321	i 10 0	+4	18 5	+11	—	25.9
Honolulu		-1.2	61.4	92	—	—	e 14 32	? PR ₁	—	—
Batavia		-1.2	61.9	209	i 10 30	+13	i 19 3	+31	—	—
Hamburg		-1.2	63.7	325	i 10 26	-3	—	—	53.9	—
Vienna		-1.2	65.6	320	i 10 44	+3	19 28	+10	—	37.9
Eskdalemuir		-1.2	66.3	335	i 10 28	-18	e 18 58	-28	—	—
De Bilt		-1.2	67.0	328	10 42	-8	19 21	-14	—	—
Zagreb		-1.3	67.6	318	10 56	+2	i 19 53	+12	36.9	—
Uccle		-1.3	67.9	328	e 10 46	-9	e 19 30	-15	—	—
Innsbruck		-1.3	68.3	323	i 10 54	-4	—	—	—	—
Strasbourg		-1.3	68.6	325	i 10 52	-8	e 19 52	-2	e 28.9	—
Padova		-1.3	69.7	320	11 7	0	20 1	-6	—	—
Pompeii		-1.3	72.3	316	e 10 44	-39	20 52	+14	—	—
Rocca di Papa		-1.3	72.4	317	i 11 19	-5	i 20 37	-2	e 61.1	—
Tortosa		-1.3	77.9	325	11 43	-16	21 26	-18	—	—
La Paz		—	141.2	31	18 24	[-77]	—	—	—	—

Additional readings and notes: Taihoku reading has been increased by 1h. Tiflis gives also $e = +21m.16s.$ Konigsberg $iZ = +11m.47s.$ Vienna $PS = +20m.6s., e = +22m.35s.$ Eskdalemuir $i = +13m.12s., eE = +22m.8s.$ De Bilt $ePR_1 = +13m.21s., eE = +19m.54s.$ and $+22m.37s.$ Uccle $eSR_1 = +22m.46s.$ Padova $PR_1 = +12m.0s., SR_1 = +20m.21s.;$ all readings are diminished by 2h. The solution cannot be regarded as satisfactory, but it is difficult to suggest an alternative. The La Paz observation suggests a very deep focus, which is not supported by other observations. Possibly it is not [P] at all, but P: the residual according to adopted tables would then be $+69s.$, but an error of 1 minute is also possible. The assumed focal depth of .010 is supported chiefly by the observations in azimuths near 320° , those near azimuths 200° being rather the worse for the hypothesis. If we omit the correction for focal depth, all the stations, except the Japanese, suggest moving the epicentre further north, say to $54^{\circ}0'N$. $130^{\circ}5'E$, but this would throw out the Japanese observations.

Aug. 14d. Readings also at 3h. and 5h. (near Athens), 6h. (Colombo), 10h. (near Athens), 13h. (Taihoku), 15h. (near Mizusawa), 17h. (near Athens (2)), 20h. (Bergen), 21h. (Eskdalemuir, De Bilt, Strasbourg, Uccle, and near Tokyo), 23h. (Taihoku (2) and Athens).

Aug. 15d. 14h. 53m. 12s. Epicentre $37^{\circ}5'N$. $23^{\circ}0'E$. (as on Aug. 8d.).

$$A = +.730, B = +.310, C = +.609; \quad D = +.391, E = -.921; \\ G = +.560, H = +.238, K = -.793.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	0.7	51	i 0 26	+17	—	—	i 0.6	3.6
Pompeii	7.3	299	i 1 59	+8	3 34	+16	4.8	—
Belgrade	7.5	347	e 1 57	+3	i 4 9	?L	(i 4.2)	6.1
Rocca di Papa	9.0	302	i 2 20	-4	(e 3 48)	-15	—	4.4
Zagreb	9.8	330	2 27	0	—	—	—	5.8

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Florence	10.9	309	4 40	?S	(4 40)	-12	—	4.8
Padova	11.5	317	2 48	- 4	(7 57)	?L	8.0	9.6
Vienna	11.5	338	2 52	0	—	—	e 7.0	8.8
Innsbruck	13.0	323	i 3 12	- 1	—	—	—	—
Zurich	14.5	318	e 3 30	- 3	e 6 19	- 1	—	—
Strasbourg	15.6	320	e 3 46	- 1	e 7 59	?L	8.8	—
Algiers	15.9	273	e 3 53	+ 2	6 48	- 5	—	—
Hamburg	18.5	335	e 4 17	- 6	—	—	—	12.8
Uccle	18.8	321	e 4 22	- 5	e 8 1	+ 3	—	—
De Bilt	19.2	325	e 4 31	0	e 8 6	0	—	—
Upsala	22.6	354	e 4 59	-13	i 9 9	- 8	—	—
Eskdalemuir E.	25.1	324	—	—	e 9 48	-17	—	—

Padova gives also $PR_1 = +2m.54s.$

Aug. 15d. Readings also at 2h. (near Calcutta), 3h. (near Athens), 4h. (Colombo), 6h. (Taihoku), 12h. (near Nagasaki), 23h. (Lick).

Aug. 16d. 9h. 41m. 30s. Epicentre $37^{\circ}.5N. 23^{\circ}.0E.$ (as on Aug. 15d.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens N.	0.7	51	e 0 13	+ 2	—	—	i 0.9	1.5
Pompeii	7.3	299	e 2 27	+36	—	—	—	—
Belgrade	7.5	347	e 1 53	- 1	e 1 59	-85	—	2.7
Rocca di Papa	9.0	302	—	—	i 3 48	-15	—	3.9
Zagreb	9.8	330	e 2 30	+ 3	—	—	—	5.5
Hamburg	18.5	335	—	—	—	—	e 9.5	—
De Bilt	19.2	325	—	—	e 7 3	-63	—	—

Additional readings and notes: Athens gives also $e = +34s.$, $ME = +1.0m.$
 Belgrade ePN (alternative) = +33s. All these readings are reduced by 10m.
 Zante ($\Delta = 3^{\circ}.3$) gives a reading at 9h.35m.

1922. Aug. 16d. 15h. 56m. 25s. Epicentre $52^{\circ}.5N. 157^{\circ}.5E.$

(as on 1922 Mar. 6d.).

A = - .562, B = + .233, C = - .793; D = - .383, E = - .924;

G = - .733, H = + .304, K = - .609.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Ootomari	11.2	241	3 29	+42	—	—	5.9	8.4
Mizusawa E.	17.5	227	4 25	+14	—	—	—	—
Tokyo	21.0	224	5 6	+13	(e 9 5)	+21	e 9.1	9.5
Nagoya	22.6	228	4 42	-30	—	—	—	—
Osaka	23.7	230	5 16	- 9	(9 48)	+10	9.8	10.1
Kobe	23.9	230	(5 8)	-19	5 8	?P	7.9	9.9
Nagasaki	28.0	236	6 9	+ 1	10 50	- 9	13.7	—
Zi-ka-wei	33.7	245	e 6 56	- 6	e 12 28	- 8	—	21.8
Taihoku	38.5	239	—	—	e 12 54	-51	—	—
Hong Kong	44.6	244	8 26	- 4	—	—	22.7	27.6
Honolulu E.	46.1	116	—	—	14 53	-36	21.7	20.9
Manila	47.7	232	e 8 52	0	(16 0)	+10	16.0	—
Victoria	48.0	61	9 22	+28	(15 1)	-53	i 15.1	23.4
Berkeley E.	55.3	71	9 35	- 6	17 5	-20	e 26.0	—
Calcutta E.	59.7	270	13 44	?PR ₁	23 44	?SR ₁	33.9	39.8
Simla E.	60.1	283	18 35	?S	(18 35)	+11	36.7	37.4
N.	60.1	283	18 29	?S	(18 29)	+ 5	37.9	38.4
Upsala	63.1	339	i 10 34	+ 1	i 19 3	+ 1	e 32.7	40.7
Konigsberg	66.9	335	i 10 56	- 1	19 48	- 1	e 34.6	47.6

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L	M.
	e	o	m. s.	s.	m. s.	s.	m.	m.
Tiflis	69.5	514	e 11 35	+22	c 20 41	+23	e 36.2	17.7
Chicago	70.2	46	11 2	-16	20 5	-23	34.6	—
Lemberg	70.3	330	e 11 23	+4	e 20 41	+11	e 39.0	46.2
Edinburgh	70.4	350	—	—	i 20 38	+7	29.6	52.1
Hamburg	70.5	341	i 11 22	+2	e 20 25	-7	e 34.6	38.6
Eskdalemuir	71.0	359	i 11 21	-2	20 33	-5	34.6	44.5
Ann Arbor	71.5	43	11 5	-22	20 23	-21	40.5	—
Bombay	71.9	278	16 56	?PR ₁	—	—	—	—
Ottawa	72.0	37	11 16	-14	20 29	-21	32.6	—
Toronto	72.1	40	e 11 23	-8	e 19 47	-64	e 36.6	41.2
Stonyhurst	72.3	348	—	—	—	—	—	48.9
Batavia	72.6	233	i 11 36	+2	i 21 6	+9	e 38.7	—
De Bilt	E. 72.8	343	11 35	0	20 58	-2	e 36.6	42.3
	N. 72.8	343	—	—	—	—	e 35.6	50.0
Vienna	E. 73.9	334	i 11 42	+1	i 20 57	-16	e 35.1	—
	73.9	334	e 11 41	0	i 21 12	-1	—	42.9
Oxford	74.2	348	i 11 49	+6	i 21 20	+4	32.6	54.0
Uccle	74.2	341	11 40	-3	21 12	-4	e 36.6	42.8
Ithaca	74.3	39	—	—	—	—	36.6	—
Strasbourg	75.7	340	i 8 35	?	i 18 5	?	36.6	44.6
Kodaikanal	75.8	270	21 47	?S	(21 47)	+12	47.4	50.0
Belgrade	75.9	330	i 11 52	-2	i 21 31	-5	41.6	49.8
Innsbruck	76.1	337	i 11 54	-2	i 21 31	-7	e 37.6	52.4
Zagreb	76.3	333	i 11 54	-3	21 36	-5	e 35.6	41.6
Paris	76.5	344	e 11 53	-5	e 21 35	-8	e 34.6	43.6
Zurich	76.6	339	11 55	-4	21 38	-6	—	—
Colombo	76.9	266	12 35	+35	22 53	+65	50.6	54.6
Georgetown	77.0	40	i 11 48	-13	e 21 48	-1	39.0	—
Besatçom	77.4	340	—	—	—	—	e 40.6	—
Padova	77.7	336	12 2	-3	21 51	-6	39.6	53.6
Florence	79.4	337	13 35	?	22 25	+9	29.1	48.6
Rocca di Papa	80.9	334	i 12 23	-1	i 22 29	-5	e 29.3	56.6
Pompeii	81.4	332	13 31	+64	34 33	?	44.6	—
Barcelona	83.6	342	e 12 35	-5	23 0	-5	—	53.4
Tortosa	N. 84.5	344	12 35	-10	23 2	-12	38.0	52.8
Helwan	85.2	316	i 12 41	-8	23 15	-6	53.6	58.1
Riverview	86.5	185	e 12 55	-1	e 23 4	-32	e 37.3	—
Coimbra	E. 86.5	350	12 48	-8	23 26	-10	41.6	51.5
	N. 86.5	350	—	—	23 22	-14	—	57.6
Alzais	88.0	339	12 54	-11	23 49	-3	44.1	60.1
Rio Tinto	88.6	349	48 35	?L	—	—	(48.6)	63.6
Granada	88.8	347	i 13 0	-9	i 23 47	-14	44.6	48.2
San Fernando	89.8	348	—	—	23 41	-31	—	57.6
Melbourne	91.0	190	—	—	i 24 5	-19	—	61.1
La Paz	129.3	60	19 17	[0]	33 47	?	74.6	80.0
Cape Town	145.5	286	78 38	?L	—	—	(78.6)	—

Additional readings: Ootomari readings are increased by 2h., also MN = +7.4m. Mizusawa gives also SN = +4m.26s. Tokyo eS = +6m.53s., MN = +9.7m. Osaka MN = +10.0m. Kobe P = +3m.35s. Zi-ka-wei MN = +18.7m. Honolulu PR₁ = +9m.56s., SR₁E = +18m.28s., SR₁N = +18m.18s., L = +20.9m., MN = +21.0m., T₀ = 15h.55m.58s. Upsala PR₁ = +14m.44s., PS = +19m.43s., MN = +68.2m. Königsberg eLN = +32.6m., MZ = +48.6m. Tiflis e = +15m.53s., [e] = +21m.23s., eL = +26.4m., MN = +47.8m. Hamburg PS = +21m.23s., SR₁ = +25m.41s., MZ = +46.3m., MN = +46.4m. Eskdalemuir SR₁ = +26m.5s. MN = +62.8m., T₀ = 15h.56m.33s. Origin 52°N. 147°E. Ann Arbor PE = +12m.23s. Toronto eL = +46.9m. and +58.7m. Batavia iN = +22m.47s. and +24m.7s. Vienna iN = +18m.40s. and +24m.34s., iE = +41m.51s. Uccle MN = +47.8m. Ithaca L = +52.6m. Zagreb MNW = +43.6m. Paris MN = +51.6m. Colombo S = +44m.35s.? Georgetown LN = +45.2m. Padova PR₁ = +12m.30s., SR₁ = +24m.5s. Florence reading has been increased by 1h. Coimbra iE = +23m.38s. Granada MN = +58.9m. San Fernando MN = +62.6m.

Aug. 16d. Readings also at 1h. (Apia), 5h. (near La Paz), 6h. (Manila, Riverview, and Melbourne), 7h. (Victoria, Toronto, De Bilt, Uccle, and near Tacubaya), 10h. (Manila), 12h. (Stonyhurst, Apia, and near Zante and Athens), 13h. (Stonyhurst (2), Wellington, and Christchurch), 14h. (Sapporo), 15h. (Colombo and Kodaikanal), 18h. (Uccle), 20h. and 22h. (near Athens).

Aug. 17d. 15h. 3m. 36s. Epicentre $36^{\circ}0'N$. $28^{\circ}0'E$. (as on Aug. 13d.).

A = +.714, B = +.380, C = +.588; D = +.470, E = -.883;
G = +.519, H = +.276, K = -.809.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Athens	3.9	302	e 1 5	+ 4	e 1 37	-10	e 2.1	e 2.8
Belgrade	10.5	329	e 2 50	+13	e 4 44	+ 1	e 5.8	—
Rocca di Papa	13.2	301	—	—	—	—	e 6.5	9.4
Tiflis	14.2	61	e 3 54	+25	—	—	e 9.4	—
Vienna	15.0	329	e 3 37	- 2	—	—	—	12.7
Hamburg	21.6	330	—	—	e 8 4	-53	—	16.7
De Bilt	22.8	322	—	—	—	—	e 12.4	15.4

Additional readings: Athens gives its P and S as e's, also eL = +1.2m. Tiflis
e = +6m.48s. Hamburg MN = +14.5m. De Bilt MN = +13.2m.

Aug. 17d. Readings also at 0h. (Dehra Dun, Colombo, Simla, Hamburg, and De Bilt), 3h. (Algiers), 4h. (near La Paz), 6h. and 10h. (Zagreb), 13h. (La Paz), 14h. (Strasbourg), 18h. (Tiflis), 20h. (La Paz).

Aug. 18d. 5h. 12m. 15s. Epicentre $36^{\circ}5'N$. $122^{\circ}0'W$. (as on 1922 Mar. 16d.).

A = -.426, B = -.682, C = +.595; D = -.848, E = +.530;
G = -.315, H = -.504, K = -.804.

An epicentre further south would suit Lick and Berkeley better, but there is not evidence enough to justify departure from the origin previously adopted.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Lick	0.9	18	i 0 9	- 5	i 0 27	+ 2	—	0.8
Berkeley	1.4	352	e 0 19	- 2	i 0 46	+ 7	—	1.4
Tucson	E. 10.1	111	—	—	e 4 26	- 6	—	5.7
	N. 10.1	111	—	—	e 4 15	-17	—	5.2
Victoria	11.9	355	—	—	—	—	4.8	7.7
Chicago	27.0	68	—	—	—	e 23.0	—	—
Toronto	32.6	65	—	—	—	—	22.2	—
Honolulu	N. 34.8	256	—	—	—	e 15.4	—	—
Ithaca	35.2	66	—	—	—	—	17.8	—
Georgetown	E. 35.3	72	—	—	—	—	17.2	—
Washington	35.3	72	—	—	—	e 19.0	—	—
Ottawa	35.5	61	—	—	—	e 17.8	—	—
Northfield	37.8	63	—	—	—	e 16.8	—	—
Eskdalemuir	74.4	32	—	—	—	—	40.8	—
Stonyhurst	75.7	33	e 33 15	?L	—	(e 33.8)	42.4	—
De Bilt	80.2	30	—	—	—	e 44.8	45.6	—

Additional readings and notes: Lick gives also iPEN = +12s., iPN = +19s., iPZ = +20s., iPEZ = +21s., iSE₂ = +37s., iSZ₂ = +39s., MN = +0.9m., MZ = +1.3m. Berkeley iPENZ = +29s., iZ = +37s., iN = +40s., iEN = +54s., iSEN = +56s., MZ = +1.3m., MN = +1.6m. Toronto reading has been increased by 30m. Stonyhurst reading has been diminished by 1hr.

Aug. 18d. 19h. 50m. 26s. Epicentre $13^{\circ}0'N$. $85^{\circ}4'W$. (as on 1922 Feb. 16d.).

A = +.078, B = -.971, C = +.225; D = -.997, E = -.080;
G = +.018, H = -.224, K = -.974.

The serious objection to this solution is that stations near the adopted epicentre (such as La Paz, Tacubaya, &c.) and even N. American stations give no record of the shock. But it is difficult to suggest any very different epicentre from the evidence of European stations.

	Δ °	Az. °	P. m. s.	O - C. s.	L. m.	M. m.
Coimbra	71.8	51	—	—	e 57.6	—
Eskdalemuir	74.9	37	—	—	38.6	—
Uccle	79.8	41	e 12 58	+40	e 41.6	—
De Bilt	80.1	40	—	—	e 42.6	50.6
Hamburg	82.7	37	e 12 34	0	e 44.6	—
Rocca di Papa	87.3	48	e 12 58	- 3	e 42.8	57.0
Vienna	88.0	40	12 56	- 9	—	52.6
Zagreb	N.E. 88.4	43	e 13 7	0	e 44.6	53.6
	N.W. 88.4	43	e 13 9	+ 2	—	49.6
Tiflis	108.7	37	—	—	e 43.6	49.8

Additional readings: De Bilt gives also MN = +51.6m. Rocca di Papa
e = +6m.46s.

Aug. 18d. Readings also at 6h. (Riverview), 7h. (Zante and Manila), 14h. and 15h. (La Paz), 17h. (Coimbra), 18h. (De Bilt), 20h. (Colombo, Perth, and Honolulu), 21h. (Florence, Uccle, De Bilt, and Victoria), 23h. (Batavia).

Aug. 19d. 23h. 18m. 8s. Epicentre $37^{\circ}5N$. $23^{\circ}0E$. (as on 16d.),

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	0.7	51	i 0 11	0	i 0 20	0	i 0.4	0.6
Belgrade	7.5	347	c 3 29	?S	(e 3 29)	+ 5	i 5.6	—
Rocca di Papa	9.0	58	3 58	?S	(3 58)	— 5	—	5.5
Zagreb	9.8	330	—	—	e 3 52	-31	—	5.9
De Bilt	19.2	325	—	—	—	—	e 10.9	—

Additional readings: Athens gives also MN = +0.7m. Belgrade is = +4m.35s.

Aug. 19d. Readings also at 2h. (near Nagasaki), 3h. (La Paz), 5h. (near Osaka and Kobe), 7h. (Tiflis), 8h. (Paris), 20h. (Strasbourg and Riverview), 21h. (Zante and near Mizusawa), 23h. (Rocca di Papa).

Aug. 20d. 3h. 14m. 35s. Epicentre $22^{\circ}0N$. $125^{\circ}5E$. (as on 1913 Jan. 7d.).

A = -538, B = +755, C = +375; D = +814, E = +581;
G = -218, H = +305, K = -927.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku	4.7	310	1 18	+ 5	—	—	1.8	1.9
Manila	8.6	211	e 3 43	?S	(e 3 43)	-10	—	—
Zi-ka-wei	9.3	338	e 3 15	+55	e 4 10	0	—	—
Tokyo	18.5	39	e 4 27	+ 4	—	—	—	—
De Bilt	89.5	328	—	—	—	—	e 45.4	—

No additional readings.

Aug. 20d. 5h. 0m. 36s. Epicentre $44^{\circ}5N$. $11^{\circ}5E$. (as on 1922 May 25d.).

A = +699, B = +142, C = +701.

Very doubtful.

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Padova	0.9	-0 1	-15	0 24	- 1	1.2	1.9
Rocca di Papa	2.8	e 0 48	+ 4	—	—	—	1.4
Zagreb	3.4	e 0 48	- 5	—	—	—	2.1
Zurich	3.5	(1 1)	+ 6	1 1	?P	—	—
Besancon	4.7	1 24	+11	—	—	—	—
Strasbourg	4.8	e 1 29	+15	e 2 4	- 7	—	—
Vienna	5.0	e 1 19	+ 2	—	—	—	3.6

Additional readings: Padova gives also $SR_1 = +34s$. Rocca di Papa eN = +24s. Zurich eP = +22s.

Aug. 20d. Readings also at 2h. (Azores and near Tokyo), 7h. (Azores and Taihoku), 13h. (Colombo, Nagoya, and near Osaka and Kobe), 14h. (near Manila), 15h. (Azores), 16h. (Taihoku, Athens, and Stonyhurst), 20h. (Athens, Florence, Simla, Taihoku, and Stonyhurst).

Aug. 21d. 19h. 22m. 10s. Epicentre $12^{\circ}\text{OS. } 69^{\circ}\text{OW.}$ (as on 1920 Oct. 7d.).

A = +.351, B = -.913, C = -.208; D = -.934, E = -.358;

G = -.075, H = +.194, K = -.978.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
La Paz	4.6	169	1 13	- 2	1 58	- 8	2.1	2.4
La Quiaca	10.6	163	3 50	-72	—	—	5.0	6.2
Andalgala	N. 15.8	171	3 50	+ 1	—	—	4.3	5.1
Pilar	E. 20.2	167	9 44	?/2	(9 44)	+77	10.2	11.3
Mendoza	20.9	178	9 8	?/2	(9 8)	+26	11.0	13.0
Cipolletti	27.0	178	—	—	(10 2)	-39	10.0	12.8
Eskdalemuir	86.7	31	—	—	—	—	42.8	—
Uccle	89.1	39	—	—	—	—	e 47.8	—
De Bilt	E. 90.0	38	—	—	—	—	e 48.8	—
Hamburg	93.3	36	—	—	—	—	e 66.8	—
Zagreb	95.1	45	—	—	—	—	e 57.8	—
Colombo	148.8	98	85 50	?L	—	—	(85.8)	—

Additional readings: La Quiaca gives also MN = +5.7m. Pilar LN = +10.1m., MN = +10.7m. Cipolletti readings have been increased by 10m. De Bilt eLN = +49.8m.

Aug. 21d. Readings at 0h. (Azores), 2h. (Rocca di Papa), 6h. (Azores), 7h. (near Vera Cruz), 13h. (Tiflis), 17h., 19h., and 20h. (Azores), 22h. (near Mizusawa), 23h. (Azores).

Aug. 22d. Readings at 1h. (Port au Prince), 3h. (near Athens), 7h. (Taihoku and near Tokyo), 11h. (Azores), 14h. (Batavia), 15h. (Zi-ka-wei), 16h. (Strasbourg and Taihoku), 17h. (near Athens), 20h. (2) and 21h. (Batavia).

Aug. 23d. Readings at 0h. (Batavia), 4h. (Vienna, De Bilt, Königsberg, Hamburg, Simla, Zagreb, and Edinburgh), 6h. (De Bilt), 11h. (near Tacubaya), 14h. (Colombo, Batavia, Kodaikanal, and near Tacubaya), 15h. (Manila, Hong Kong, Colombo, Simla, Kodaikanal, and Batavia), 20h. (Batavia and Azores).

Aug. 24d. 17h. 12m. 30s. Epicentre $44^{\circ}\text{5N. } 11^{\circ}\text{5E.}$ (as on 20d.).

	Δ	P.	O-C.	S.	O-C.	M.
	°	m. s.	s.	m. s.	s.	m.
Florence	0.7	0 15	+ 4	—	—	0.5
Padova	0.9	0 32	+18	0 45	+20	1.3
Zagreb	3.4	—	—	e 1 30	- 4	—
Zurich	3.5	e 0 51	- 4	i 1 30	- 7	—

No additional readings.

Aug. 24d. 19h. 45m. 18s. Epicentre $35^{\circ}\text{5N. } 141^{\circ}\text{0E.}$ (as on 1922 April 10d.).

A = -.633, B = +.512, C = +.581.

	Δ	P.	O-C.	S.	O-C.	L.	M.
	°	m. s.	s.	m. s.	s.	m.	m.
Tokyo	1.1	1 0 17	0	1 0 24	- 7	—	0.4
Mizusawa	E. 3.6	0 56	0	1 35	- 4	—	—
Kobe	4.9	e 1 22	+ 6	(2 20)	+ 6	2.3	2.5
Batavia	52.6	—	—	(e 15 7)	-104	e 15.1	18.1

Additional readings: Tokyo gives also MN = +2.2m., all readings being given as at 20h. Mizusawa SN = 1m.33s.

Aug. 24d. Readings also at 0h. (Strasbourg), 7h. (Mizusawa), 14h. (La Paz), 16h. (Strasbourg), 19h. (near Batavia).

Aug. 25d. 11h. 43m. 20s. Epicentre $13^{\circ}5S$. $162^{\circ}0E$. (as on 1920 Nov. 6d.).

A = -0.25, B = +0.300, C = -0.233 ; D = +0.309, E = +0.951 ;

G = +0.222, H = -0.072, K = -0.972.

Very rough.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Sydney		22.6	204	9 25	?S	(9 25)	+ 8	10.3	15.0
Riverview		22.6	204	e 5 40	+28	e 10 1	+44	e 11.5	—
Melbourne		28.7	209	6 40	+25	11 58	+46	14.7	17.7
Adelaide		29.8	220	—	—	—	—	e 13.7	17.5
Manila		49.4	304	e 8 58	- 5	—	—	19.3	—
Honolulu	E.	52.4	49	9 20	- 2	16 40	- 9	23.2	27.0
	N.	52.4	49	—	—	—	—	24.3	27.1
Hong Kong		59.0	307	12 44	?PR ₁	—	—	28.7	31.7
Kodaikanal		87.2	281	59 4	?L	—	—	(59.1)	—
Berkeley	E.	87.3	50	—	—	—	—	e 68.9	—
Victoria		90.2	40	—	—	—	—	29.2	45.7
Chicago		114.1	50	—	—	—	—	e 50.7	—
Toronto		119.8	47	—	—	—	—	70.0	—
Ottawa		122.0	44	—	—	e 59 10	?L	e 64.7	—
Hamburg		134.2	337	—	—	e 38 40	?	e 66.7	—
Eskdalemuir		136.6	347	—	—	—	—	66.7	79.7
Zagreb		136.8	325	e 23 40	?PR ₁	—	—	e 65.7	69.7
De Bilt	E.	137.2	339	—	—	—	—	e 59.7	74.6
	N.	137.2	339	—	—	—	—	e 64.7	77.5
Uccle		138.5	339	—	—	—	—	e 58.7	—

Additional readings and notes : Sydney P has been increased by 10m. Honolulu gives also $SR_1N = +21m.2s.$, $LN = +26.7m.$, $T_0 = 11h.43m.27s.$ Eskdalemuir $MN = +84.7m.$ Zagreb $MNW = +78.7m.$

Aug. 25d. 11h. 47m. 24s. Epicentre $36^{\circ}5N$. $1^{\circ}5E$.

A = +0.804, B = +0.021, C = +0.595 ; D = +0.026, E = -1.000 ;

G = +0.595, H = +0.016, K = -0.804.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Algiers		1.3	76	i 0 25	+ 5	0 45	+ 9	1.0	1.2
Granada		4.1	280	1 2	- 2	i 1 46	- 7	i 1.9	2.9
Tortosa		4.4	351	1 5	- 3	1 58	- 3	2.2	5.7
Barcelona		5.0	6	e 1 12	- 5	2 7	-10	e 2.4	3.1
San Fernando		6.2	272	2 32	+57	3 12	?L	(3.2)	5.1
Coimbra	E.	8.6	299	e 3 28	?S	(e 3 28)	-25	e 4.9	5.5
	N.	8.6	299	e 3 29	?S	(e 3 29)	-24	5.2	6.6
Puy de Dôme		9.3	6	3 36?	?S	(3 36?)	-34	—	—
Moncalieri		9.7	28	e 3 9	+43	4 58	?L	6.6	9.3
Rocca di Papa		10.1	55	e 2 54	+23	—	—	e 5.1	9.3
Besançon		11.2	16	—	—	—	—	5.6	—
Zurich		12.1	24	e 2 57	- 3	—	—	e 7.3	—
Paris		12.4	3	—	—	5 36	+ 7	—	—
Strasbourg		12.9	19	3 8	- 4	e 6 4	+22	7.1	9.6
Innsbruck		13.1	31	i 3 11	- 3	e 5 24	-22	—	—
Zagreb		14.3	45	3 31	+ 1	—	—	e 9.6	12.6
Uccle		14.5	8	e 2 31	-62	—	—	e 7.1	8.6
Kew		15.0	356	—	—	—	—	—	8.6
Oxford		15.4	354	—	—	6 36	- 5	—	9.3
De Bilt	E.	15.8	8	—	—	—	—	8.0	11.2
	N.	15.8	8	—	—	—	—	9.1	11.8
Vienna		16.0	38	i 3 49	- 3	—	—	i 10.7	—
Hamburg		18.1	17	e 4 14	- 4	—	—	e 10.0	11.4
Eskdalemuir		19.1	352	i 4 27	- 3	e 8 5	+ 1	8.1	10.8
Edinburgh		19.6	352	—	—	—	—	10.6	12.1
Königsberg		22.5	30	-i 0 8	?	2 15	?	e 13.3	15.9

Additional readings : Granada gives also $PR_1 = +1m.12s.$, $MN = +2.8m.$ Barcelona $MN = +6.4m.$ San Fernando $MN = +4.9m.$ Coimbra $SE = +4m.19s.$, $iSN = +4m.29s.$, $T_0E = 11h.49m.50s.$, $T_0N = 11h.49m.37s.$ Hamburg $MN = +15.6m.$

1922. Aug. 25d. 19h. 29m. 30s. Epicentre 50°·0N. 91°·8E.

A = -·020, B = +·643, C = +·766 : D = +1·000, E = +·031 ;

G = -·024, H = +·766, K = -·643.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°		m. s.	s.	m. s.	s.	m.	m.
Simla	E.	21·8	216	5 6	+ 3	8 54	+ 7	—	—
	N.	21·8	216	5 24	+21	9 0	- 1	e 14·3	—
Dehra Dun		22·2	213	5 30	+23	—	—	—	—
Calcutta	E.	27·6	187	6 15	+10	11 32	+40	16·6	—
	N.	27·6	187	6 17	+12	11 22	+30	17·7	—
Zi-ka-wei		29·0	119	e 6 19	+ 1	—	—	—	20·6
Hong Kong		32·8	140	12 15	?S	(12 15)	- 6	17·7	18·5
Nagasaki		32·9	107	e 10 22	?S	(e 10 22)	-120	18·6	21·1
Tiflis		33·2	273	e 6 54	- 4	e 12 6	-21	e 18·0	22·0
Ootomari		33·4	77	16 15	?L	—	—	18·7	19·7
Taihoku		33·9	127	—	—	—	—	e 15·7	—
Bombay		34·6	213	4 26	?	—	—	—	—
Kobe		34·9	99	—	—	—	—	e 22·1	23·5
Osaka		35·1	99	16 3	?L	—	—	(16·0)	22·9
Tokyo		37·2	94	—	—	—	—	e 19·1	22·4
Upsala		41·4	315	7 49	-17	14 5	-22	e 22·3	25·6
Kodaikanal		41·5	203	19 6	?L	—	—	24·0	25·3
Konigsberg		41·8	306	7 59	-10	13 57	-35	e 21·1	25·5
Lemberg		42·1	296	e 8 6	- 6	—	—	e 19·6	25·5
Manila		42·6	137	e 8 47	+32	—	—	24·5	26·5
Colombo		44·2	198	15 6	?S	(15 6)	+ 1	26·5	28·8
Bergen		46·6	319	e 21 30	?L	—	—	29·5	—
Belgrade		46·7	291	e 8 37	- 8	e 21 55	?	e 26·4	—
Vienna		47·2	299	i 8 44	- 4	(i 15 45)	+ 1	e 25·0	29·0
Hamburg		47·9	309	e 8 48	- 5	—	—	e 23·3	26·7
Zagreb		48·8	295	8 55	- 4	15 58	- 6	e 24·5	30·5
Innsbruck		50·6	300	e 8 53	-18	—	—	e 27·7	31·7
De Bilt	E.	51·2	309	9 19	- 5	16 30	- 4	25·6	32·8
	N.	51·2	309	—	—	—	—	24·7	29·1
Padova		51·3	299	9 25	+10	18 53	?SR ₁	(28·0)	31·4
Dyce	N.	51·7	318	—	—	—	—	—	28·5
Strasbourg		51·8	303	e 9 22	+ 3	—	—	e 27·5	32·0
Zurich		52·1	301	e 9 18	- 3	—	—	—	—
Uccle		52·3	308	e 9 20	- 2	e 16 48	0	24·5	33·4
Edinburgh		52·9	315	16 54	?S	(16 54)	- 1	27·0	36·1
Rocca di Papa		53·1	293	e 9 27	0	(e 16 54)	- 3	i 28·7	33·9
Eskdalemuir		53·3	315	i 9 33	+ 5	17 4	+ 4	24·5	29·4
Besançon		53·6	303	9 39?	+ 9	—	—	27·5	—
Stonyhurst		53·8	314	e 16 54	?S	(e 16 54)	-12	30·5	32·5
Moncalieri		54·0	300	i 7 42	-111	19 26	+137	27·4	33·8
Kew		54·2	310	21 30	?SR ₁	—	—	—	31·5
Paris		54·4	308	e 9 41	+ 6	e 17 16	+ 2	28·5	34·5
Oxford		54·6	311	—	—	e 17 16	0	25·5	35·3
Barcelona		59·4	299	—	—	—	—	e 31·5	36·9
Tortosa		60·3	300	10 23	+ 9	—	—	30·8	35·4
Algiers		62·0	295	e 10 31	+ 6	e 18 56	+ 8	33·5	40·0
Granada		65·5	300	i 10 58	+10	e 19 58	+17	33·5	36·2
Coimbra	E.	66·0	305	10 54	+ 3	19 48	+11	30·9	36·3
	N.	66·0	305	11 18	+27	—	—	32·4	42·2
Rio Tinto		66·7	302	37 30	?L	—	—	(37·5)	40·5
San Fernando		67·5	300	—	—	—	—	—	41·7
Victoria		77·1	24	—	—	—	—	34·7	47·5
Ottawa		84·1	351	12 48	+ 5	23 8	- 1	49·5	—
Honolulu	N.	85·9	62	29 5	?SR ₁	40 10	?	56·0	47·4
Cape Town		105·9	236	58 30	?L	—	—	(58·5)	—

Additional readings and notes : Zi-ka-wei gives also MN = +21·0m. Tiflis
e = +12m.42s., +13m.54s., and +19m.54s., MN = +21·7m. Kobe MN =
+22·5m. Osaka MN = +22·8m. Tokyo MN = +26·1m. Upsala
MN = +24·3m. Konigsberg MNZ = +22·6m. Manila MN = +25·9m.
Colombo S = +28m.18s. and +21m.0s. Bergen e = +25m.30s. Vienna
PR₁E = +11m.25s., SN = +17m.26s., PSE? = +18m.28s., the true S is
given as iE. Hamburg iPR₁ = +10m.40s., SR₂ = +19m.30s., MZ =
+30·0m. Strasbourg iPR₁ = +10m.40s., SR₂ = +19m.30s. Zagreb
PNW = +8m.56s., PR₁NE = +10m.47s., PR₁NW = +10m.50s., PR₂NE =
+12m.24s., SR₁ = +19·5m., MNW = +28·3m. De Bilt PR₁ = +11m.12s.,
SR₁ = +20m.18s. Padova L given as P of a second shock. Strasbourg
e = +20m.39s., MN = +28·1m. Uccle ePR₁ = +11m.27s., eSR₁ =
+20m.30s., MN = +29·4m. Edinburgh S = +21m.6s. Rocca di Papa
e = +11m.42s., also S is given as eL. Eskdalemuir SR₁ = +21m.5s., MN =
+28·8m. Stonyhurst S = +21m.0s. (?SR₁). Granada PS = +21m.30s.
San Fernando MN = +46·5m. Honolulu eSR₁N = +46m.52s., eSR₂N =
+52m.0s. T₀ = 19h.45m.26s.

Aug. 25d. Readings also at 1h. (Tiflis), 2h. (Tiflis and Riverview), 3h. (near Merida), 9h. (Taihoku), 15h. (Puebla), 22h. (Toronto).

Aug. 26d. 2h. 19m. 25s. Epicentre $7^{\circ}08.145^{\circ}0E$. (as on 1920 Oct. 22d.).

A = -0.813, B = +0.569, C = -0.122; D = +0.574, E = +0.819;
G = +0.100, H = -0.070, K = -0.993.

Very rough.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Riverview	27.4	169	e 5 56	- 6	i 10 56	+ 8	e 13.9	—
Adelaide	28.5	191	—	—	—	—	—	18.6
Melbourne	30.7	180	—	—	e 11 17	-29	15.9	20.0
Manila	32.2	312	—	—	e 11 47	-24	15.2	—
Honolulu	62.6	62	—	—	—	—	e 25.4	—
De Bilt	124.2	331	—	—	—	—	e 60.6	—
Uccle	125.4	331	—	—	—	—	e 59.6	—
Eskdalemuir	125.5	338	—	—	—	—	58.6	—
La Paz	139.5	126	19 45	[+ 6]	—	—	23.7	24.0

De Bilt gives also $eE = +42m.35s.$, $e = +51m.35s.$

Aug. 26d. 6h. 25m. 16s. Epicentre $9^{\circ}08.163^{\circ}0E$.

A = -0.945, B = +0.289, C = -0.156; D = +0.292, E = +0.956;
G = +0.150, H = -0.046, K = -0.988.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Apia	25.2	103	5 43	+ 3	—	—	—	9.2
Riverview	27.2	202	e 6 5	+ 5	10 38	- 7	e 12.6	—
Melbourne	33.1	207	e 6 56	- 1	—	—	16.7	23.4
Wellington	34.0	164	e 6 26	-39	e 11 14	-86	—	11.7
Adelaide	34.3	218	e 12 44	?S	(e 12 44)	0	21.0	22.7
Honolulu	48.8	51	15 59	?S	(15 59)	- 5	22.0	24.7
	48.8	51	16 8	?S	(16 8)	+ 4	—	29.2
Berkeley	83.7	50	—	—	—	—	e 43.3	—
Victoria	86.2	40	—	—	—	—	—	45.4
Kodaikanal	87.4	281	67 50	?	—	—	—	—
Chicago	110.4	48	—	—	e 47 44	?L	56.7	—
Cipolletti	112.5	139	48 26	?L	—	—	(48.4)	51.9
Mendoza	115.7	133	47 14	?L	—	—	(47.2)	54.7
Toronto	116.0	45	—	—	—	—	e 64.4	71.9
Pilar	119.5	135	42 8	?L	—	—	(42.1)	63.8
Andalgala	119.9	129	44 32	?L	—	—	(44.5)	47.9
Hamburg	130.4	339	—	—	—	—	e 82.7	—
Eskdalemuir	132.4	349	—	—	—	—	81.7	—
De Bilt	133.2	340	—	—	e 43 8	?	e 86.7	91.4
	133.2	340	—	—	e 33 56	?	e 84.7	96.0
Stonyhurst	133.6	347	e 81 44	?L	—	—	(e 81.7)	96.4
Uccle	134.6	340	—	—	—	—	—	83.7
Kew	135.3	346	90 44	?L	—	—	(90.7)	95.7

Additional readings: Apia gives also MN = +19.9m. Adelaide eS? = +17m.14s. Honolulu eN = +18m.29s., SE = +20m.19s. Berkeley
eZ = +17m.26s., eE = +33m.44s. Pilar PN = +56m.14s. Toronto e = +61m.8s., eL = +69.7m.

Aug. 26d. Readings also at 0h. (Puebla), 2h. (Melbourne), 7h. (near Tacubaya), 8h. (Port au Prince, Oaxaca, and Taihoku), 11h. (near Mizusawa), 12h. (Tiflis), 17h. (Tacubaya), 19h. (near Mizusawa).

Aug. 27d. Readings at 4h. (Vera Cruz and near Zurich and Padova), 7h. (near Tacubaya), 9h. (W. Bromwich), 11h. (Mizusawa), 12h. (Zagreb, De Bilt, and near Athens), 15h. and 12h. (Manila).

Aug. 28d. Readings at 6h. (near Tacubaya), 8h. (Hamburg, Coimbra, Uccle, and near Tokyo), 10h. (Batavia), 16h. (La Paz), 18h. (2), 21h., and 22h. (Batavia).

Aug. 29d. 3h. 36m. 0s. Epicentre $38^{\circ}0'N$, $33^{\circ}5'E$.

A = +.657, B = +.435, C = +.616; D = +.552, E = -.834;
G = +.513, H = +.340, K = -.788.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Athens	E.	7.7	273	e 2 51	+54	e 3 19	+20	e 3.9	5.0
	N.	7.7	273	—	—	3 41	-12	e 3.8	5.3
Tiflis		9.4	63	e 3 18	-56	e 4 24	+11	e 5.1	8.9
Belgrade	E.	11.9	309	—	—	i 6 13	?L	(i 6.2)	8.1
	N.	11.9	309	e 3 3	+5	e 6 10	?L	(e 6.2)	6.4
Lemberg		13.6	333	—	—	e 5 54	-4	—	8.5
Zagreb		15.1	307	3 43	-3	e 6 12	-8	e 8.0	8.8
Vienna		16.1	315	i 3 57	+4	i 7 2	+5	e 8.5	10.1
Rocca di Papa		16.3	290	e 3 54	2	7 0	-2	—	11.2
Padova		17.7	302	4 14	+1	(7 49)	+16	(9.4)	11.8
Königsberg		19.0	336	i 4 35	+6	7 58	-4	—	12.3
Moncalieri		20.4	298	i 5 7	+21	8 44	+12	13.1	—
Zürich		20.5	305	e 4 46	-1	e 8 22	-12	—	—
Strasbourg		21.4	308	e 5 0	+2	e 12 6	?L	e 16.0	—
Hamburg		22.4	322	e 5 8	-2	(e 9 18)	+5	e 9.3	13.9
De Bilt		24.2	315	—	—	e 9 42	-6	—	15.9
Uccle		24.2	312	e 5 27	-3	e 9 38	-10	—	—
Paris		24.7	306	—	—	9 0	-57	—	13.0
Kew		27.2	311	—	—	—	—	—	11.0
Oxford		27.9	311	i 6 1	-6	e 11 45	+48	—	—
Eskdalemuir		30.0	317	e 6 23	-5	e 11 15	-19	—	20.0

Additional readings: Tiflis gives also $e = +6m.30s.$, MN = +7.4m. Zagreb
MNW = +9.2m. Rocca di Papa ePN = +4m.0s. Padova MN = +11.5m.
L and S are given as S and PR₁ respectively.

Aug. 29d. 17h. 0m. 48s. Epicentre $12^{\circ}0'N$, $123^{\circ}1'E$. (as on 1915 Mar. 12d.).

A = -.534, B = -.819, C = -.208; D = -.838, E = -.516;
G = -.114, H = -.174, K = -.978.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Manila		3.3	322	i 1 0	-8	(i 1 34)	-3	i 1.6	—
Taihoku		13.1	354	e 3 19	+5	—	—	6.9	—
Hong Kong		13.4	322	3 16	-2	(5 39)	-14	5.6	9.2
Zi-ka-wei		19.2	356	e 4 41	+10	e 8 19	+13	—	15.4
Nagasaki		21.5	16	5 10	+11	(9 18)	+23	9.3	—
Batavia		24.4	222	5 30	-2	9 52	0	e 17.2	—
Kobe		25.2	24	5 50	+10	8 50	-77	10.8	15.2
Osaka		25.3	24	6 23	+42	(10 47)	-38	10.8	12.1
Tokyo		28.0	30	e 7 18	+70	—	—	e 12.0	13.9
Calcutta	E.	34.7	291	6 50	-21	—	—	18.3	21.8
Colombo		43.0	267	11 0	?	14 48	0	19.0	28.2
Kodaikanal		44.8	276	15 42	?S	(15 42)	+30	23.0	28.7
Sinla	N.	46.4	302	15 30	?S	(15 30)	-3	28.2	—
Bombay		48.4	283	15 48	?S	(15 48)	-11	—	—
Adelaide		49.2	164	—	—	15 48	-21	23.6	28.0
Sydney		53.0	151	13 54	?	—	—	27.2	30.2
Riverview		53.0	151	—	—	e 17 13	+17	e 24.8	—
Melbourne		53.8	160	—	—	17 6	0	34.3	39.7
Tiflis		73.4	311	e 12 12	+34	e 21 6	-1	24.0	49.9
Honolulu	E.	75.4	71	—	—	—	—	—	55.2
Helwan		85.4	300	e 13 12	+22	23 16	-7	55.2	57.2
Königsberg	E.	87.2	326	—	—	—	—	e 43.2	53.7
	N.	87.2	326	—	—	e 23 30	-13	e 40.2	49.2
Vienna		91.9	321	13 36	-10	e 24 32	-2	e 42.7	51.2
Bergen		92.5	334	16 12	?	—	—	40.2	57.2
Zagreb		93.0	319	13 42	+10	24 6	-39	e 42.2	60.5
Hamburg		93.5	327	e 13 42	-7	e 24 36	-15	e 46.2	58.1
Victoria		95.9	38	—	—	(e 24 58)	-17	e 25.0	55.7

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	96.7	316	e 13 54	+ 1	24 54	-29	e 48.5	65.2
De Bilt	E. 96.8	327	—	—	e 24 55	-29	e 47.2	60.7
	N. 96.8	327	—	—	e 25 2	-22	e 45.2	53.5
Florence	96.8	318	32 12?	?S	—	—	48.2	53.9
Strasbourg	97.0	323	—	—	e 34 12	?	47.2	—
Uccle	97.8	326	—	—	e 25 0	-34	e 46.2	60.8
Moncalieri	98.5	320	e 17 59	?PR ₁	30 15	?SR ₁	49.2	62.4
Edinburgh	98.6	333	—	—	e 25 12	-30	47.2	59.1
Besançon	98.6	322	—	—	—	—	54.2	—
Eskdalemuir	99.1	332	e 17 12	?PR ₁	e 24 24	-83	45.2	53.7
Stonyhurst	99.6	331	e 25 42	?S	(e 25 42)	-10	54.4	59.7
Paris	99.8	325	—	—	e 24 12	-102	e 48.2	61.2
Kew	99.8	328	—	—	—	—	—	60.2
Oxford	100.3	329	—	—	—	—	50.2	61.5
Barcelona	103.7	318	—	—	—	—	e 57.4	65.6
Tortosa	105.2	320	33 58	?SR ₁	—	—	e 48.2	61.2
Algiers	105.5	313	—	—	—	—	e 64.2	67.2
Cape Town	108.8	238	61 12	?L	—	—	(61.2)	—
Granada	109.8	319	—	—	—	—	e 56.2	107.9
Coimbra	E. 111.2	322	e 31 22	?	e 40 19	?	e 53.2	61.9
	N. 111.2	322	—	—	—	—	e 55.2	66.4
San Fernando	111.9	318	51 18	?L	—	—	(51.3)	73.7
Chicago	119.3	26	30 17	?S	—	—	e 54.2	—
Ottawa	120.2	15	e 20 31	?PR ₁	e 26 10	-161	e 55.2	—
Toronto	120.7	19	—	—	—	—	46.2	—
Ithaca	122.7	15	—	—	—	—	66.2	—
Georgetown	125.7	18	e 21 34	?PR ₁	28 3	-88	—	—
La Paz	168.2	113	20 38	[+24]	—	—	81.1	103.3

Additional readings and notes: Zi-ka-wei gives also MN = +14.3m., MZ = +14.0m. Batavia i = +8m.19s. Kobe MN = +14.3m. Osaka MN = +12.8m. Colombo L = +26.8m. Melbourne PR₁ = +11m.0s. Tiflis e = +23m.36s., MN = +44.6m. All readings are originally given for 14h., and have been increased by 3h. Zagreb PR₁ = +17m.6s., PR₂ = +21m.36s., MNW = +53.2m. Hamburg MN = +58.0m., MZ = +58.3m. Rocca di Papa ePR₁ = +18m.0s. Uccle MN = +53.8m. Eskdalemuir MN = +63.5m. Paris MN = +52.2m. San Fernando MN = +70.6m. Ottawa e = +30m.35s. Toronto L = +33.3m.

Aug. 29d. Readings also at 10h., 17h. (3), 18h., 20h., and 22h. (2) (Manila).

Aug. 30d. 10h. 27m. 25s. Epicentre 3°-0N. 122°-0E. (as on 1921 Nov. 16d.).

A = -529, B = +847, C = +052; D = +848, E = +530;
G = -028, H = +044, K = -999.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	11.3	5	e 3 11	+22	—	—	6.8	7.7
Batavia	17.7	239	i 5 27	+74	e 9 1	?L	(9.0)	—
Hong Kong	20.8	339	5 5	+14	—	—	10.0	—
Taihoku	22.0	359	—	—	e 8 39	-26	—	—
Zi-ka-wei	28.0	2	e 10 59	?S	(10 59)	0	(e 13.8)	16.3
Colombo	42.3	278	9 35	+82	15 53	+74	30.2	34.1
Melbourne	46.0	152	—	—	e 15 29	+ 1	28.3	31.3
Riverview	46.0	146	e 18 50	?SR ₁	—	—	e 29.2	—
Honolulu	E. 79.5	69	—	—	e 22 15	- 3	e 40.2	41.6
Zagreb	99.0	318	—	—	—	—	50.6	—
Hamburg	100.3	326	—	—	—	—	e 52.6	—
De Bilt	103.7	325	—	—	e 29 35	+185	e 50.6	59.9
Uccle	104.6	324	—	—	—	—	—	54.6
Edinburgh	106.1	332	—	—	—	—	e 62.6	—
Eskdalemuir	106.6	332	—	—	—	—	49.6	—
Stonyhurst	106.8	330	e 57 35	?L	—	—	(e 57.6)	68.1
Coimbra	117.4	319	33 3	?S	e 45 35	?	63.6	—

Additional readings and notes: Manila gives also MN = +7.8m. Batavia gives iS = +9m.34s. All readings given as on 31 days. Taihoku reading is given as at 11h. Zi-ka-wei readings are given as eP and eS respectively. Melbourne iS = +19m.17s. Honolulu eE = +35m.15s.

Aug. 30d. 22h. 40m. 42s. Epicentre $20^{\circ}0'N$. $114^{\circ}0'W$.

A = -·382, B = -·858, C = +·342 ; D = -·914, E = +·407 ;
G = -·139, H = -·312, K = -·940.

Very doubtful.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mazatlan	7·7	64	—	—	—	—	2·6	—
Tucson N.	12·6	12	—	—	e 5 31	- 3	e 7·0	9·0
Vera Cruz E.N.	16·8	89	—	—	—	—	8·7	10·5
Lick E.	18·6	341	—	—	—	—	e 11·1	—
Berkeley	19·3	340	e 5 54	+ 81	—	—	e 10·4	—
Victoria	29·4	347	—	—	—	—	15·0	18·4
Chicago	31·1	40	11 36	? 7	(11 36)	-17	15·0	—
Ann Arbor	33·9	42	—	—	—	—	e 16·3	—
Georgetown N.	36·9	52	—	—	—	—	e 18·1	—
Washington	36·9	52	—	—	—	—	e 18·1	—
Toronto	37·2	43	—	—	—	—	e 15·5	19·6
Ithaca	38·6	48	e 7 48	+ 5	e 13 54	+ 8	19·6	—
Ottawa	40·4	42	—	—	e 13 56	-17	e 17·3	—
Honolulu N.	41·1	280	—	—	—	—	e 23·2	26·8
Eskdalemuir	84·7	33	—	—	—	—	38·3	—
De Bilt	90·6	32	—	—	—	—	e 45·3	—

Additional readings : Tucson gives also eE = +6m.13s., ME = +6·6m. Lick
iE = +14m.9s. Berkeley eLN = +11·0m. Chicago S = +14m.6s. (?SR₁).
Toronto eL = +19·3m. Ithaca e = +10m.18s. and +16m.36s. Ottawa
e = +10m.3s. and +16m.33s. Honolulu eE = +22m.58s.

Aug. 30d. Readings also at 0h. (near Mizusawa and Tokyo), 2h. and 3h. (Manila),
5h. (Manila (2)), 8h. (Paris), 9h. (Riverview), 10h. (De Bilt), 14h. (Tiflis),
15h. and 17h. (Manila), 18h. (La Paz).

Aug. 31d. Readings at 2h. (Kodaikanal and Colombo), 3h. (Manila (2)), 4h.
(Taihoku), 6h. (Vera Cruz and Merida), 8h. (Manila), 9h. (near Athens),
16h. (near La Paz), 17h. (Algiers and Manila), 20h. (Azores, Manila, near
Tokyo, and Mizusawa).

1922. Sept. 1d. 19h. 16m. 0s. Epicentre $25^{\circ}0'N$. $121^{\circ}5'E$.

A = -·472, B = +·773, C = +·423 ; D = +·853, E = +·522 ;
G = -·221, H = +·360, K = -·906.

See note at end.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku	0·1	22	0 21	+19	—	—	—	—
Zi-ka-wei	6·2	359	1 0?	-35	2 0?	-49	—	—
Hong Kong	7·1	249	1 56	+ 8	—	—	—	—
Manila	10·4	183	i 2 25	-11	(i 4 49)	+ 9	i 4·8	7·5
Nagasaki	10·7	42	2 44	+ 4	(4 53)	+ 5	4·9	7·0
Kobe	15·3	48	3 45	+ 2	6 54	+15	e 8·8	9·6
Osaka	15·5	48	3 41	- 5	(6 56)	+12	6·9	—
Nagoya	16·8	49	3 6	-56	(7 53)	+40	7·9	10·2
Tokyo	19·0	51	i 4 23	- 6	e 7 37	-25	e 10·9	17·5
Mizusawa E.	21·8	45	4 54	- 9	9 42	+41	—	—
N.	21·8	45	4 53	-10	9 40	+39	—	—
Ootomari	27·5	33	6 5	+ 2	(11 6)	+16	11·1	16·7
Calcutta E.	30·3	273	6 24	- 7	11 48	+ 9	—	—
N.	30·3	273	6 27	- 4	11 39	0	17·2	20·0
Batavia	34·3	207	i 6 52	-15	11 52	-52	e 19·0	—
Dehra Dun	38·5	288	8 0	+18	—	—	—	—
Simla E.	39·2	290	7 36	-12	13 30	-24	24·4	25·5
Colombo	43·6	254	8 36	+13	13 30	-86	15·3	32·5
Kodaikanal	44·2	260	7 18	-69	(15 0)	- 5	15·0	29·9
Bombay	45·2	273	8 22	-12	15 6	-12	24·4	26·8
Adelaide	62·2	165	—	—	i 18 30	-21	e 30·5	41·0
Tiflis	64·0	307	10 46	+ 8	e 19 26	+13	32·0	40·5
Sydney	65·4	153	10 48	+ 1	19 24	- 6	26·8	32·5
Melbourne	66·6	160	10 36	-19	i 19 24	-21	31·4	35·6

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Honolulu	E.	72.9	75	—	—	—	—	34.0	43.6
	N.	72.9	75	11 34	— 1	21 12	+11	33.9	36.0
Upsala		75.1	330	i 11 53	+ 3	21 30	+ 3	e 34.4	48.6
Lemberg		75.6	319	e 12 5	+12	e 22 0	+27	e 45.6	50.0
Konigsberg	E.	75.6	325	i 11 54	+ 1	—	—	e 27.3	48.8
	N.	75.6	325	i 11 54	+ 1	e 22 39	+66	e 32.8	42.3
Sitka	E.	75.9	34	—	—	21 38	+ 2	42.4	49.2
	N.	75.9	34	—	—	21 43	+ 7	46.6	60.1
Helwan		77.9	297	i 12 8	+ 2	22 5	+ 6	—	23.2
Budapest		79.6	319	e 11 13	-64	e 24 21	+122	39.8	—
Belgrade		79.9	315	i 12 19	+ 1	i 22 34	+12	e 31.6	49.3
Bergen		80.1	334	8 37	?	—	—	47.5	50.9
Athens		80.5	309	e 12 21	- 1	e 22 34	+ 5	e 32.0	50.2
Vienna		80.8	320	12 25	+ 1	22 57	+24	e 40.0	54.8
		80.8	320	i 12 28	+ 4	22 39	+ 6	i 43.9	44.2
Hamburg		81.8	327	i 12 29	0	i 22 46	+ 2	e 39.0	52.0
Wellington		82.7	143	e 12 36	+ 2	i 22 36	-18	40.4	50.0
Innsbruck		84.2	321	i 12 42	- 1	e 22 57	-13	e 39.0	54.7
Padova		84.9	319	12 46	- 1	23 22	+ 4	—	56.3
De Bilt		85.0	327	12 47	- 1	23 21	+ 2	e 39.0	54.2
Dyce	N.	85.1	334	i 12 47	- 2	23 15	- 5	29.4	47.9
Pompeii		85.6	313	i 12 48	- 3	i 23 13	-13	37.0	59.0
Strasbourg	E.	85.6	323	i 12 47	- 4	e 23 41	+15	e 30.0	45.5
	N.	85.6	323	i 12 49	- 2	e 23 45	+19	e 32.0	46.4
Zurich		85.8	321	i 12 49	- 3	23 29	+ 1	—	—
Florence		86.1	319	12 55	+ 1	23 12	-19	41.8	47.8
Uccle		86.1	326	i 12 51	- 3	23 29	- 2	e 39.0	53.9
Rocca di Papa		86.3	315	i 12 51	- 4	23 12	-21	e 45.6	60.1
Edinburgh		86.4	333	i 12 57	+ 2	i 23 32	- 2	40.0	56.1
Victoria		86.6	37	12 24	-33	(22 49)	-48	e 44.1	55.1
	Z.	86.6	37	12 40	-17	—	—	—	57.5
Eskdalemuir		86.8	333	i 12 54	- 4	23 38	- 1	39.5	46.7
Besançon		87.4	323	e 12 59	- 2	23 37	- 8	43.0	—
Stonyhurst		87.5	330	(12 54)	- 8	12 54	?P	44.2	52.0
Moncalieri		87.6	320	13 3	0	24 5	+17	30.2	59.4
Kew		88.0	329	17 0	?PR ₁	—	—	—	58.0
West Bromwich		88.1	329	13 1	- 5	23 40	-13	—	—
Paris		88.3	325	i 13 0	- 7	e 23 27	-28	41.0	49.0
Oxford		88.3	329	13 1	- 6	23 43	-12	41.4	56.8
Puy de Dôme		89.9	323	13 0	-15	—	—	—	—
Marseilles		89.9	320	e 13 0	-15	23 41	-32	40.0	47.0
Berkeley		93.3	45	e 13 25	- 9	e 24 31	-17	e 39.4	—
Tortosa	N.	94.3	321	13 28	-12	23 54	-65	38.6	63.2
Algiers		95.2	316	13 31	-13	e 26 13	+65	47.0	56.0
Granada		99.1	319	17 50	?PR ₁	i 27 0	+73	i 33.5	51.3
Coimbra	E.	99.8	325	e 13 48	-22	24 48	-66	47.5	65.7
	N.	99.8	325	—	—	—	—	48.3	59.8
Rio Tinto		100.5	321	46 0	?L	—	—	(46.0)	69.0
San Fernando		101.1	320	18 18	?PR ₁	28 0	+114	50.0	60.5
Johannesburg		103.6	247	—	—	—	—	33.0	54.0
Tucson		104.1	43	—	—	e 44 47	?	51.4	52.3
Ottawa		107.9	13	18 56	?PR ₁	28 25	+76	e 42.3	—
Chicago		108.0	22	18 56	?PR ₁	28 35	+85	42.2	—
Toronto		108.7	15	18 54	?PR ₁	28 42	+86	i 46.1	67.6
Ann Arbor		108.8	20	19 0	?PR ₁	28 24	+67	e 41.7	—
Northfield		109.6	11	e 23 0	?	28 55	+91	e 61.0	—
St. Louis		109.8	26	i 15 0?	+ 4	27 6	-20	e 50.0	60.0
Ithaca		110.5	14	e 19 19	?PR ₁	28 56	+83	50.0	—
Georgetown		113.8	15	e 18 41	?PR ₁	29 35	+95	e 41.3	72.3
	Z.	113.8	15	e 18 52	?PR ₁	28 38	+38	66.0	—
Washington		113.8	15	20 44	?PR ₁	30 30	?	44.8	—
Cape Town		113.9	242	29 28	?S	(29 28)	+87	—	62.0
Cheltenham	E.	114.0	15	—	—	e 28 22	+20	55.8	56.3
	N.	114.0	15	—	—	e 29 32	+90	66.2	71.9
Merida		125.0	36	—	—	—	—	—	80.0
Porto Rico	N.	136.3	9	—	—	—	—	76.4	78.4
Cipolletti		163.9	152	45 18	?SR ₁	—	—	99.6	112.5
La Paz		167.7	49	i 20 18	[+ 4]	i 34 44	?	77.5	84.0
Mendoza		168.4	135	19 30	[-44]	—	—	28.4	110.3
Chacareta	E.	170.4	180	—	—	—	—	81.3	93.0
Pilar	E.	171.9	146	20 54	[+38]	—	—	31.9	46.7
	N.	171.9	146	21 30	[+74]	—	—	31.9	56.9
Andalgala	N.	172.6	113	21 24	[+68]	—	—	82.3	93.0
La Quiaca	E.	172.9	68	—	—	—	—	100.2	120.9
	N.	172.9	68	—	—	—	—	99.7	100.0

For Notes see next page.

NOTES TO SEPT. 1d. 19h. 16m. 0s.

Additional readings and notes: Manila gives also $iS = +2m.50s.$, $MN = +5.5m.$
 Nagasaki $MN = +16.8m.$ Kobe $MN = +10.6m.$ Tokyo $iPR = +4m.24s.$, $MN = +12.6m.$ Ootomari $MN = +16.2m.$ Batavia $i = +8m.11s.$ and $+12m.17s.$ Adelaide $iSR_2 = +25m.54s.$ Tiflis $PR_1 = +13m.9s.$, $e = +13m.32s.$, $+15m.15s.$, $+19m.43s.$, $+23m.33s.$, $+24m.8s.$, $+27m.28s.$, and $+30m.39s.$, $MN = +43.6m.$ Sydney readings have been diminished by 2h. Honolulu $SR_1N = +25m.50s.$, $SR_2N = +29m.20s.$, $T_0 = 19h.15m.54s.$ Upsala $PR_2 = +16m.53s.$, $PR_3 = +18m.5s.$, $SR_1 = +26m.48s.$, $SR_2 = +30m.17s.$, $MN = +42.7m.$ Sitka $eE = +17m.27s.$, $eN = +15m.3s.$, $PSE? = +22m.33s.$, $SR_1E = +27m.2s.$, $SR_2N = +30m.57s.$, $eE = +36m.59s.$, $eN = +33m.7s.$, $T_0 = 19h.15m.51s.$ Budapest readings have been increased by 10m. Belgrade $PR_1 = +13m.12s.$ and $+14m.36s.$ Bergen $PR_1 = +15m.0s.$, $SR_1 = +38m.32s.$ Athens $i = +23m.40s.$, $T_0 = 19h.16m.6s.$ Vienna $iN = +1.1m.51s.$, $PR_1E = +15m.39s.$, $PR_1N = +15m.51s.$, $iZ = +17m.32s.$, $iE = +21m.53s.$, $iN = +21m.59s.$, $iN = +22m.59s.$, $PSE = +23m.45s.$, $PSN = +23m.48s.$, $SR_1 = +28m.35s.$, $iE = +31m.51s.$, $iZ = +42m.21s.$, $MZ = +74.8m.$ Hamburg $PR_1 = +16m.2s.$, $PR_2 = +19m.23s.$, $PS = +23m.43s.$, $SR_1 = +28m.48s.$, $SR_2 = +32m.58s.$, $SR_3 = +34m.42s.$, $MN = +45.7m.$, $MZ = +51.9m.$ Wellington $ePR_1 = +15m.36s.$, $e = +21m.36s.$, $iSR_1 = +28m.48s.$, $SR_2 = +32m.36s.$, $L = +43.4m.$, and $+45.9m.$, $T_0 = 19h.16m.22s.$ De Bilt $PR_1 = +16m.8s.$, $PR_2 = +18m.23s.$, $PR_3 = +19m.47s.$, $SR_1 = +29m.17s.$, $MN = +47.8m.$ Strasbourg $PR_1E = +16m.22s.$, $PR_2E = +19m.41s.$, $SR_1E = +29m.41s.$ Zurich $PR_1 = +16m.12s.$ Uccle $PR_1 = +16m.13s.$, $PR_2 = +18m.31s.$, $PR_3 = +19m.57s.$, $SR_1 = +29m.41s.$, $SR_2 = +34m.11s.$, $MN = +47.0m.$ Rocca di Papa $L = +29.1m.$, $eLN = +47.1m.$ Edinburgh $PR_1 = +16m.38s.$, $SR_1 = +29m.43s.$ Eskdalemuir $PR_1 = +16m.24s.$, $PR_2 = +19m.52s.$, $PS? = +22m.48s.$, $i = +23m.22s.$, and $+24m.59s.$, $SR_1 = +29m.34s.$, $SR_2 = +33m.34s.$, $MN = +45.8m.$ Victoria S is given as L: also S is given as $+16m.52s.$ ($?PR_1$), $e = +28m.56s.$, $iL = +57.3m.$, $eL = +73.8m.$, and $+75.5m.$ Stonyhurst $eP = +2m.0s.$ Moncalieri $MN = +67.3m.$ Paris $PR_1 = +16m.35s.$ Oxford $PR_1 = +16m.53s.$ Marseilles $MN = +59m.0s.$ Berkeley $iS = +23m.54s.$ Algiers $? = +24m.0s.$, $MN = +64.0m.$ Coimbra $PR_1 = +18m.0s.$, $iE? = +27m.4s.$, $iN? = +27m.16s.$, $T_0 = 19h.16m.44s.$ Ottawa $L = +49.0m.$, $T_0 = 19h.23m.26s.$ Toronto $i = +20m.42s.$ and $+24m.0s.$, $iL = +65.0m.$, $eL = +90.7m.$, and $+118.9m.$ Ann Arbor $L = +48.0m.$, $+59.7m.$, and $+71.6m.$, $T_0 = 19h.23m.36s.$ Ithaca $e = +35m.18s.$, $L = +58.0m.$, and $+63.0m.$ Georgetown $LE = +56.0m.$, $LN = +57.0m.$ Cheltenham $PR_1E = +20m.0s.$, $eN = +25m.1s.$, $PSN? = +30m.46s.$, $SR_1E = +35m.58s.$, $SR_1N = +36m.58s.$, $eE = +40m.38s.$, $LN = +56.0m.$, $T_0 = 19h.16m.34s.$ La Paz $i = +26m.11s.$ and $+32m.17s.$, $SEN = +35m.0s.$, $iSR_1 = +45m.59s.$, $LN = +68.0m.$ and $+79.0m.$

NOTE.—Originally $25^{\circ}0'N$, $121^{\circ}0'E$. was adopted for the epicentre of this shock, and for Sept. 14d. and 16d. the slightly different position $25^{\circ}0'N$, $121^{\circ}5'E$. After the reductions had been made direct comparisons were made, first between Sept. 14d. and 16d., which were found to be satisfactorily in accord, and then between the mean of these two and Sept. 1d. This last comparison gave:—

for Az. 277° (7 stations) differences of $-2s.$ and $+4s.$ for P and S.
 Az. 320° (10 stations) differences of $+4s.$ and $0s.$
 Az. 50° (6 stations) differences of $0s.$ and $+12s.$ (?)

This evidence was not considered sufficient to justify a separate epicentre for Sept. 1d., and accordingly the same epicentre has been adopted for all three.

The following note on the earthquakes of Sept. 1, 14, and 16 were circulated by the Taihoku Meteorological Observatory (Formosa, Japan). The times given were those of $120^{\circ}E.$, and have been altered to Greenwich Time.

THE EARTHQUAKES OF NORTH FORMOSA.

September 1st and 14th, 1922.

On the 1st of September, at 19h. 16m. 21s. a.m. (G.M.T.) an earthquake of intensity VII VIII (Rossi-Forel) occurred in North Formosa causing some damage and followed by many aftershocks. Again, on the 14th of September, at 19h.31m.48s. a.m. the earthquake of nearly the same intensity, from the same origin, caused more danger than the former. The area felt strongly was one-third of the Island in the north part and very slight in South Formosa. On the 16th strong aftershocks of intensity III-VI occurred five times and on the 17th two times. The approximate origin calculated from the preliminary tremor

durations at various stations was $24^{\circ}5N$. and $122^{\circ}3E$. (off the east coast of North Formosa). Information came from Dainano and Gokots on the east coast near the epicentre that the aftershocks occurred very frequently, with sounds like distant thunder sometimes, at intervals of 5 or 10 minutes on the 14th and the following several days. Many landslips in the steep mountains and in numerous places of the cliff roads along the seashore made it impossible for travellers to pass. The Omori seismographs at Taihoku and Karenko (magnifications 120 and 50 respectively) recorded numerous aftershocks unprecedented in the Island. A policeman residing at Gokots station counted the number of aftershocks very carefully and reported to the observatory. The following list gives the number of the aftershocks classified according to the intensity at these three stations.

Intensity. (Rossi Forel).	Taihoku. (September).	Karenko. (September).	Gokots. (September).	Taihoku. (October and November).	Karenko. (October and November).	Gokots. (October and November).
Minor	1378	266	—	560	213	—
0 unfelt	129	303	—	68	99	—
1 felt (I-II)	63	75	194	25	41	94
2 (III-IV)	7	6	68	5	5	57
3 (V)	2	5	62	1	1	21
4 (VI)	1	1	9	—	—	4
5 (VII-VIII)	1	—	1	—	—	—
Total	1581	656	334	659	359	176

The seismographs at Taihoku and Karenko are still recording two or three shocks every day even at present. The damage given below was caused principally on the 1st and 14th September, with a little damage by the aftershocks on 15th, 16th, 17th September, 14th October, and 1st and 12th December.

People killed	17	Houses destroyed	47
„ injured	34	„ destroyed partially	41
		„ injured	811

A large part of the damage was due to the fragile and bad construction of the old Chinese houses, built of sun-dried mud blocks which mostly have no capacity for resisting earthquake shocks. There was no particular damage in the Japanese houses (which are built of bricks or timbers) except the crackings of plastered walls.

Sept. 1d. Readings also at 1h. (De Bilt and Uccle), 2h. (near Lick (2)), 3h. (Manila), 4h. (Lick), 5h. (La Paz), 6h. (Mizusawa), 12h. (Simla, Upsala, and Hamburg), 13h. (Königsberg, Oxford, Uccle, De Bilt, Kew, and Eskdalemuir), 19h. (Colombo, Taihoku, and near Athens), 20h. (7) and 21h. (3) (Taihoku), 22h. (Vera Cruz, Merida, Tacubaya, and near Oaxaca).

Sept. 2d. 17h. 22m. 42s. Epicentre $3^{\circ}0S$. $128^{\circ}0E$. (as on 1922 May 21d.).

$$A = -.615, B = +.787, C = -.052; \quad D = +.788, E = +.616; \\ G = +.032, H = -.041, K = -.999.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	18.9	339	e 4 34	+ 6	(7 24)	-36	7.4	8.2
Batavia	21.3	260	5 0	+ 3	i 8 44	- 6	—	—
Hong Kong	28.7	333	—	—	(10 28)	-44	10.5	—
Melbourne	38.1	159	—	—	—	—	e 16.7	29.0
De Bilt	E. 112.0	324	—	—	e 25 48	-118	e 55.3	58.2
	N. 112.0	324	—	—	e 30 0	+134	e 56.3	58.0
Uccle	113.0	325	—	—	e 29 18	+84	e 54.3	—
Eskdalemuir	114.7	332	—	—	e 27 18	-50	53.3	—

Additional readings: Manila gives also MN $- +7.9m$. Batavia $i = +6m.11s$.

Sept. 2d. Readings also at 0h. (near Athens), 1h. (near Taihoku), 5h. (De Bilt and Uccle), 7h. (near Athens), 11h. (La Paz and Eskdalemuir), 13h. (Algiers), 20h. (Honolulu), 21h. (Uccle, De Bilt, and Eskdalemuir), 22h. (near Tokyo (2)), 23h. (La Paz, Batavia, Manila, and near Tokyo (2)).

Sept. 3d. 3h. 11m. 0s. Epicentre $42^{\circ}4'N$. $21^{\circ}4'E$. (as on 1921 Sept. 2d.).

A = +.688, B = +.269, C = +.674; D = +.365, E = -.931;
G = +.628, H = +.246, K = -.738.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Belgrade	2.5	344	i 1 3	-24	i 1 44	+35	(i 1.7)	1.9
Mostar	2.7	290	e 0 18	-24	i 0 48	-26	—	1.0
Sinj	3.7	291	e 1 20	?S	(e 1 20)	-22	(i 1.9)	2.0
Athens	4.8	157	e 1 39	+25	2 27	+16	e 2.7	3.1
Pompeii	5.3	255	e 1 15	-7	2 45	+20	(2.8)	—
Rocca di Papa	6.4	262	i 1 42	+4	2 48	-7	—	—
Vienna	6.8	331	2 4	+20	4 1	?L	(4.0)	—
Padova	7.5	297	3 22	?S	(3 22)	-2	5.0	8.2
Innsbruck	8.6	308	e 2 18	+8	i 4 47	?L	(i 4.8)	—
Zurich	10.3	303	e 2 40	+6	4 44	+7	—	—
Strasbourg	11.3	308	e 4 0?	+71	e 5 21	+19	—	—
Hamburg	13.5	330	—	—	—	—	e 7.0	9.2
Uccle	14.4	311	—	—	—	—	e 7.3	—
De Bilt	14.6	317	—	—	—	—	e 7.8	9.9
Eskdalemuir	20.5	317	—	—	—	—	e 12.0	—

Additional readings: Belgrade gives also $iP = +1m.14s$. Mostar $iP = +24s$.
Sinj $iP = +1m.52s$. Athens $MN = +3.4m$. Rocca di Papa $SE = +3m.0s$.
Vienna $PR_1 = +3m.17s$, $SR_1 = +4m.9s$. Strasbourg readings have been increased by 10m. De Bilt $MN = +9.8m$. Eskdalemuir $e = 2h.58m$, $L = 4h.2m$.

Sept. 3. Readings also at 0h. (near Tokyo (2) and near Batavia), 1h. (Colombo and near Mizusawa), 2h. (Manila and near Tokyo (2)), 3h. (Georgetown, Washington, Chicago, Ann Arbor, Ottawa, Sitka, and near Tokyo), 4h. (De Bilt and near Tokyo), 5h. (near Tokyo), 6h. (near Mizusawa, Tokyo, and Nagasaki), 9h. (Athens), 10h. (near Batavia), 11h. (Algiers), 14h. (Manila), 15h. (Kobe).

Sept. 4d. 17h. 4m. 8s. Epicentre $9^{\circ}0'S$. $66^{\circ}0'W$.

A = +.402, B = -.902, C = -.156; D = -.914, E = -.407;
G = -.064, H = +.143, K = -.988.

This determination is rough. A depth of focus 0.080 is found necessary. It will be seen that the value of T_0 is supported by Georgetown, Ottawa, Berkeley, Coimbra, Tortosa, Tacubaya, and Zurich, though there are many discordant observations elsewhere, especially those of P. We could satisfy most of the observations by moving the epicentre some 8° north, but this would be quite inconsistent with the La Paz records, and the observations of [P] at Batavia and Manila indicate a very deep focus.

	Corr. for Focus	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz	-0.1	7.8	195	i 1 54	-3	—	—	3.2	3.0
Vera Cruz	-6.1	41.0	315	—	—	—	—	—	13.4
Tacubaya	-6.4	43.3	312	7 5	-24	12 35	-47	—	—
Georgetown	-6.4	43.3	312	7 4	-25	12 34	-48	—	—
Washington	-7.1	49.0	350	e 8 8	-2	i 14 32	-2	—	—
Ithaca	-7.1	49.0	350	8 5	-5	15 26	+52	—	—
St. Louis	-7.4	52.3	352	e 10 20	+108	i 15 5	-9	—	—
Ann Arbor	-7.4	52.7	337	—	—	i 14 58	-21	—	—
Chicago	-7.5	53.8	345	i 9 52	+70	i 15 34	+2	—	—
Ottawa	-7.6	54.5	341	10 27	+101	i 15 20	-20	—	—
Berkeley	-7.6	55.1	353	i 8 52	+1	i 15 52	+4	—	—
San Fernando	-8.5	70.3	317	10 9	-15	i 18 24	-22	—	—
Coimbra	-8.6	72.1	48	20 16	?S	(20 16)	-69	—	—
Granada	-8.6	72.3	43	10 58	+22	i 19 54	+45	e 28.4	—
Tortosa	-8.7	74.3	48	i 10 0	-49	i 19 4	-26	e 42.9	45.7
Algiers	-9.1	78.7	45	i 11 29	-14	i 20 50	+29	—	—
Barcelona	-9.1	79.1	50	13 45	?PR ₁	20 52	+26	—	—
Cape Town	-9.2	80.0	45	e 13 51	?PR ₁	e 20 57	+21	—	—
Oxford	-9.2	80.4	125	—	—	—	—	—	21.0
	-9.3	82.0	36	13 49	?PR ₁	i 21 7	+9	—	—

Continued on next page.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Stonyhurst	-9.3	82.3	34	e 20 52	? S	(e 20 52)	-10	—	—
Edinburgh	-9.3	82.9	31	14 3	? PR ₁	i 21 7	-2	—	—
Paris	-9.3	83.1	39	i 14 3	? PR ₁	i 21 13	+1	—	—
Dyce	N. 9.4	84.0	29	14 5	? PR ₁	i 21 15	-6	—	—
Uccle	-9.4	84.9	38	e 14 13	? PR ₁	i 21 25	-7	—	—
Moncalieri	-9.4	85.1	44	e 13 23	+90	21 37	+3	32.7	—
Besançon	9.4	85.1	41	14 7	? PR ₁	e 21 28	-6	—	—
De Bilt	-9.4	85.8	37	—	—	i 21 31	-11	—	—
Strasbourg	-9.4	86.2	40	e 14 5	? PR ₁	i 21 31	-16	e 29.9	—
Zurich	9.5	86.4	42	e 12 5	+5	i 21 38	-10	—	—
Rocca di Papa	9.6	87.7	48	e 14 32	? PR ₁	i 21 46	-15	e 45.9	—
Padova	9.6	88.0	44	—	—	22 22	+17	—	—
Hamburg	-9.7	89.0	36	e 14 34	? PR ₁	i 21 52	-23	34.9	—
Vienna	-9.8	91.7	41	e 10 21	-129	i 22 4	-41	—	53.9
Konigsberg	-9.9	95.3	35	—	—	i 22 12	-71	—	—
Batavia	E. —	163.2	155	i 19 1	{ -69°	—	—	—	—
Manila	—	171.2	310	e 18 52	{ -83°	—	—	—	—

Additional readings: Tacubaya gives also $SR_3N. = +15m.54s.$, $SR_3E. = +15m.53s.$, $SR_3Z. = +15m.49s.$ Georgetown $e. = +7m.52s.$ (minutes only), $iN. = +10m.6s.$ Ithaca $i. = +17m.2s.$, $e. = +18m.10s.$ St. Louis $i. = +17m.4s.$ Ann Arbor $i. = +17m.28s.$ Chicago $SR_1? = +17m.15s.$ Ottawa $i. = +10m.52s.$ and $+17m.32s.$ Berkeley $eSZ. = +18m.23s.$ Coimbra $PR_1 = +13m.9s.$, $eLN. = +28.9m.$, $T_0 = 17h.4m.10s.$ Granada $PR_1 = +12m.13s.$ Uccle $SR_1 = +23m.4s.$ De Bilt $ePR_1 = +14m.19s.$ Strasbourg $e. = +26m.36s.$ Zurich $e. = +14m.22s.$ ($?PR_1$). Hamburg $iSR_1 = +26m.11s.$ Vienna $PR_1 = +14m.48s.$, $iPSE? = +22m.54s.$ Konigsberg $iZ. = +14m.54s.$ and $+15m.55s.$, $iN. = +22m.13s.$

Sept. 4d. 17h. 53m. 35s. Epicentre $24^\circ 0' N. 120^\circ 0' E.$ (as on 1922 May 22d.).

$$A = -.457, B = +.792, C = +.407; \quad D = +.866, E = +.500; \\ G = -.204, H = +.352, K = -.914.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Hokoto	0.6	222	e 0 0	-9	—	—	1.0	—
Taihoku	1.8	53	e 0 29	+1	—	—	0.7	—
Hong Kong	5.6	254	2 32	? S	(2 23)	-11	4.8	5.8
Zi-ka-wei	7.3	10	1 47	-4	e 3 27	+9	(e 3.4)	4.1
Manila	9.5	172	e 2 53	+30	—	—	7.1	—
Nagasaki	12.3	42	2 47	-16	(4 51)	-35	4.8	9.2
Tokyo	20.7	51	—	—	e 8 23	-15	—	—
Tiflis	63.6	309	—	—	—	—	e 34.4	—
Konigsberg	75.8	325	—	—	—	—	e 40.4	43.1
Vienna	80.8	320	e 12 49	+25	—	—	e 46.4	—
Hamburg	81.9	328	—	—	—	—	e 42.4	45.4
De Bilt	85.2	326	—	—	—	—	e 40.4	49.8
Dyce	N. 85.6	334	—	—	—	—	—	45.0
Strasbourg	85.7	322	—	—	—	—	e 45.4	—
Zurich	85.9	322	—	—	—	—	e 49.7	—
Florence	86.1	319	—	—	—	—	—	50.4
Uccle	86.3	327	—	—	—	—	e 40.4	48.4
Edinburgh	86.8	332	—	—	—	—	45.4	49.1
Besançon	87.4	322	—	—	—	—	48.4	—
Stonyhurst	87.8	330	—	—	—	—	—	51.9
Kew	88.2	329	48 25	? L	—	—	(48.4)	56.4
Paris	88.4	326	—	—	—	—	—	49.4
Oxford	88.6	329	—	—	—	—	44.4	50.2
Tortosa	N. 94.3	320	—	—	—	—	e 49.4	55.6
Coimbra	99.8	323	—	—	—	—	e 49.4	—
San Fernando	101.0	320	—	—	—	—	—	59.4
Ottawa	E. 109.1	12	—	—	—	—	59.4	—
Chicago	109.4	22	—	—	—	—	e 57.4	—
La Paz	169.3	47	43 49	? SR ₁	—	—	—	—

Additional readings: Zi-ka-wei gives also $MN = +4.2m.$ Tiflis $eL. = +37.4m.$
Coimbra $eLN. = +52.4m.$ San Fernando $MN. = +58.9m.$

Sept. 4d. Readings also at 2h. (Hong Kong, Manila, Batavia, and Zante), 3h. (De Bilt and Uccle), 12h. (Zi-ka-wei, Taihoku (2), and near Mizusawa), 14h. (near Belgrade), 15h. (Manila), 17h. (Uccle), 20h. (Taihoku), 21h. (Zi-ka-wei and Lick).

Sept. 5d. 15h. 56m. 50s. Epicentre $41^{\circ}0'N$, $23^{\circ}0'E$. (as on 1921 Mar. 30d.).

A = +.695, B = +.295, C = +.656; D = +.391, E = -.920;
G = +.604, H = +.256, K = -.755.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Belgrade	4.3	335	i 0 53	-14	i 1 55	- 3	—	3.6
Rocca di Papa	7.8	279	e 2 52	+54	(e 3 28)	- 3	—	4.9
Vienna	8.6	329	e 2 20	+10	—	—	i 4.2	5.3
Padova	9.2	302	4 34	?L	—	—	(4.6)	7.4
Strasbourg	13.1	310	—	—	—	—	e 7.0	—
Hamburg	15.3	330	—	—	—	—	e 8.2	10.3
De Bilt	16.5	318	—	—	—	—	e 8.2	9.0
Eskdalemuir	22.4	319	—	—	—	—	e 12.2	—

Additional readings and notes: Belgrade gives also iP = +1m.40s. Rocca di Papa readings are given as eP and ePV respectively.

Sept. 5d. Readings also at 2h. (Melbourne, Wellington, Azores, and Adelaide), 3h. (De Bilt), 4h. (Uccle and Eskdalemuir), 7h. (Manila and Zi-ka-wei), 8h. (near La Paz), 9h. (Berkeley), 10h. (near Nagoya, Mizusawa, and Tokyo), 15h., 16h., 19h., and 21h. (Azores), 23h. (Zi-ka-wei).

Sept. 6d. 22h. 12m. 5s. Epicentre $24^{\circ}0'N$, $123^{\circ}0'E$. (as on 1922 April 10d.).

A = -.498, B = +.766, C = +.407; D = +.839, E = +.545;
G = -.224, H = +341, K = -.913.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.7	308	-0 31	-57	—	—	—	—
Hokoto	3.2	262	—	—	e 2 43	? 3	3.0	3.3
Zi-ka-wei	7.3	349	1 47	- 4	e 3 15	- 3	—	4.2
Hong Kong	8.3	260	2 13	- 7	4 25	+40	4.8	5.8
Manila	9.6	192	e 3 7	+43	—	—	5.3	—
Kobe	E. 15.0	42	—	—	—	—	—	10.9
Osaka	15.2	43	4 42	+60	—	—	7.9	13.8
Tokyo	18.6	47	e 4 35	+11	e 7 54	+ 1	—	8.2
Kodaikanal	45.5	261	29 19	?L	—	—	(29.3)	—
Tiflis	65.9	308	—	—	—	—	e 37.9	—
Honolulu	E. 71.9	75	—	—	—	—	e 41.9	—
Konigsberg	E. 77.4	325	—	—	—	—	e 42.4	46.4
	N. 77.4	325	—	—	—	—	e 39.4	42.7
Vienna	82.6	321	—	—	—	—	e 42.9	—
Hamburg	83.4	327	—	—	—	—	e 42.9	45.9
Dyce	N. 86.7	334	—	—	—	—	45.9	56.9
De Bilt	86.7	327	—	—	—	—	e 41.9	49.8
Strasbourg	87.4	323	—	—	—	—	e 47.7	—
Uccle	87.8	326	—	—	—	—	e 41.9	48.9
Edinburgh	88.0	333	—	—	—	—	e 44.9	48.9
Rocca di Papa	88.0	316	—	—	—	—	e 46.2	55.0
Eskdalemuir	88.4	333	—	—	—	—	40.9	47.9
Stonyhurst	89.1	330	e 46 55	?L	—	—	(e 46.9)	51.9
Moncalieri	89.3	320	—	—	46 58	?L	49.1	—
Kew	89.6	329	—	—	—	—	—	55.9
Oxford	90.0	329	—	—	—	—	43.0	50.2
Paris	90.0	326	—	—	—	—	e 46.9	49.9
Granada	100.9	320	—	—	—	—	52.9	60.3

Additional readings: Zi-ka-wei gives also MZ = +4.9m. Kobe MN = +9.2m. Osaka MN = +12.9m. Tiflis reading is given as on 7d.
Dyce LN = +53.9m. De Bilt eLN = +40.9m. Moncalieri e = +43m.24s.

Sept. 6d. Readings also at 1h. (Honolulu), 5h. (Azores), 13h. (Manila, Batavia, and Azores), 14h. (Taihoku and near Tokyo), 18h. (Taihoku), 19h. (Colombo), 21h. (Taihoku, Hong Kong, and Zi-ka-wei).

Sept. 7d. Readings at 1h. (La Paz), 3h. (Zi-ka-wei), 14h. (Manila), 16h. (Zi-ka-wei), 18h. (Manila (2) and Algiers), 19h. (Zi-ka-wei (2), Taihoku (3), and Hong Kong), 20h. (Hong Kong (3), La Paz, De Bilt, and Eskdalemuir).

Sept. 8d. 6h. 0m. 26s. Epicentre $24^{\circ}0'N$. $46^{\circ}0'W$. (as on 1922 Jan. 9d.).

$A = +.635$, $B = -.657$, $C = +.407$; $D = -.719$, $E = -.695$;

$G = +.233$, $H = -.292$, $K = -.914$.

La Paz and Strasbour indicate a T_0 later by about 40sec., but this calls for a displacement of the epicentre about $5''$ both towards La Paz and Europe, i.e., in opposite directions. This could be attained by a hypothesis of deep focus, but it is simpler to adopt the T_0 shown by Eskdalemuir and Uccle.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Eskdalemuir	44.2	34	e 8 29	+2	e 15 10	+5	20.1	—
Kew	44.3	40	—	—	—	—	—	47.6
La Paz	45.9	211	8 34	-5	e 14 45	-42	20.8	—
Uccle	46.9	42	e 8 46	0	e 15 40	0	e 22.6	—
De Bilt	47.7	41	—	—	e 15 56	+6	e 21.6	—
Strasbourg	48.5	46	e 9 2	+5	(e 15 34)	-26	e 15.6	—
Vienna z.	54.2	46	9 40	+6	—	—	—	—

Eskdalemuir gives also $e = +18m.28s$.

Sept. 8d. 14h. 14m. 13s. Epicentre $4^{\circ}0'S$. $68^{\circ}0'E$.

$A = +.374$, $B = +.925$, $C = -.070$; $D = +.927$, $E = -.375$;

$G = -.026$, $H = -.065$, $K = -.998$.

Very rough. The readings at Rocca di Papa suggest a separate shock about $1''$ from Rocca, which may have affected some other European readings.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Colombo	16.1	47	3 47	-6	(6 59)	+2	7.0	9.0
Kodaikanal	17.1	33	4 11	+5	—	—	8.3	10.4
Bombay	23.4	12	e 9 41	?S	(e 9 41)	+8	—	—
Calcutta E.	33.2	37	7 15	+17	12 25	-2	18.4	—
Simla	36.2	13	—	—	e 13 41	+28	—	—
Batavia	38.8	96	i 7 26	-18	i 14 4	+15	e 18.8	—
Helwan	48.8	318	e 8 33	-26	—	—	—	34.4
Hong Kong	52.3	58	9 57	+35	—	—	—	—
Cape Town	54.8	230	17 31	?S	(17 31)	+12	—	30.8
Manila	55.7	70	e 9 39	-5	—	—	—	—
Zi-ka-wei	61.8	51	e 10 13	-11	e 18 8	-38	—	38.8
Rocca di Papa	67.9	320	e 10 29	-34	i 10 45	?	—	11.3
Vienna	68.9	328	10 51	-19	19 39	-34	e 42.8	51.8
Strasbourg	74.1	325	—	—	e 21 28	+13	37.8	—
Hamburg	75.1	330	e 11 29	-21	e 22 37	+70	e 37.8	48.8
De Bilt	76.4	327	—	—	e 20 23	-79	—	49.1
Paris	77.3	323	e 11 47	-16	—	—	—	—
Kew	79.9	325	—	—	—	—	—	55.8
Oxford	80.6	325	e 12 16	-7	—	—	—	59.1
Eskdalemuir	82.8	327	e 12 17	-18	—	—	38.8	—
Dyce N.	82.9	330	—	—	i 22 37	-19	50.4	53.9
Cipolletti	121.0	219	68 53	?L	—	—	78.1	79.3
Pilar N.	122.0	228	68 47	?L	—	—	(68.8)	72.3
Mendoza	124.6	224	65 41	?L	—	—	78.2	80.8
Andalgala E.	125.8	230	57 35	?L	—	—	61.7	63.3
La Quiaca E.	127.7	236	66 5	?L	—	—	73.5	76.8
La Paz	132.0	244	19 18	[-5]	—	—	68.9	72.2

Additional readings and notes: Bombay reading is increased by 10m. Simla gives also $eN = +9m.59s$. Zi-ka-wei $MN = +38.7m$. De Bilt $MN = +52.3m$. Dyce $iN = 13h.59m.5s$, $LN = +27.3m$. La Quiaca $LN = +78.7m$.

Sept. 8d. Readings also at 18h. (Vera Cruz), 20h. (Manila).

Sept. 9d. 0h. 15m. 47s. Epicentre $17^{\circ}5'N$, $116^{\circ}5'W$.

$$A = -.426, B = -.854, C = +.301; \quad D = -.895, E = +.446; \\ G = -.134, H = -.269, K = -.954.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Mazatlan	11.0	57	(3 9)	+25	—	—	3.1	—
Tucson	E. 15.6	18	—	—	—	—	e 8.9	9.9
	N. 15.6	18	—	—	—	—	e 9.6	11.9
Tacubaya	E. 16.5	81	3 59	0	7 7	0	—	8.0
Berkeley	E. 21.0	347	—	—	—	—	e 16.3	—
Chicago	34.6	39	12 49	?S	(12 19)	0	(16.7)	—
Honolulu	39.3	283	—	—	—	—	e 22.2	23.7
Washington	40.4	50	—	—	—	—	e 20.3	—

Additional readings: Tacubaya gives also SN=7m.10s. Honolulu MN = +23.9m. Florence ($\Delta = 102^{\circ}3'$) gives simply 0h.

Sept. 9d. Readings also at 1h. (Colima), 4h. and 6h. (Batavia), 7h. (near Kobe), 10h. (Tokyo), 11h. (near Osaka), 13h. (Batavia), 18h. (La Paz), 23h. (near Tokyo).

Sept. 10d. 6h. 8m. 56s. Epicentre $30^{\circ}6'N$, $144^{\circ}0'E$. (as on 1919 Feb. 9d.).

$$A = -.696, B = +.506, C = +.509; \quad D = +.588, E = +.809; \\ G = -.412, H = +.299, K = -.861.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Tokyo	6.2	330	e 1 35	0	2 49	0	—	2.8
Nagoya	7.5	311	2 35	+41	—	—	—	—
Osaka	8.3	302	2 26	+20	—	—	2.7	2.7
Kobe	8.6	302	—	—	—	—	2.8	3.7
Mizusawa	8.8	345	2 13	0	3 57	- 1	—	—

Additional readings: Osaka gives also MN = +3.6m. Mizusawa SN = +3m.56s.

Sept. 10d. Readings also at 3h. (Azores), 5h. (Sydney and Adelaide), 6h. (Azores and La Paz), 13h. (near Oaxaca), 14h. (near Manila), 18h. (near La Paz), 19h. (near Algiers), 21h. (Azores and near Mizusawa), 22h. (near Mizusawa).

Sept. 11d. 14h. 44m. 10s. Epicentre $0^{\circ}0'$, $122^{\circ}4'E$. (suggested by Batavia).

$$A = -.536, B = +.844, C = -.000; \quad D = +.844, E = +.536; \\ G = .000, H = .000, K = -1.000.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	14.7	354	e 3 53	-18	6 30	- 5	7.1	7.3
Batavia	16.7	248	e 4 11	-10	1 7 19	- 8	—	9.1
Hong Kong	23.7	341	5 27	- 2	(9 40)	+ 2	9.7	—
Taihoku	25.0	358	10 11	?S	(10 11)	- 8	—	—
Zi-ka-wei	31.2	358	—	—	e 11 32	-22	—	—
Kobe	E. 36.7	20	—	—	—	—	—	8.8
Nagoya	37.7	22	7 21	-15	—	—	—	—
Adelaide	38.0	158	e 8 50	?PR ₁	—	—	—	16.0
Tokyo	39.1	25	7 52	+ 5	e 15 13	+80	—	15.7
Calcutta	40.1	309	7 50	- 6	—	—	—	—
Mizusawa	E. 42.7	24	8 9	- 7	14 31	-13	—	—
	N. 42.7	24	8 8	- 8	14 30	-14	—	—
Colombo	43.0	280	14 8	?S	(14 8)	-40	23.2	30.3

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Melbourne	43.1	153	—	—	14 26	-23	22.6	27.6
Kodaikanal	45.9	284	25 14	?L	—	—	28.9	30.9
Simla E.	52.9	311	—	—	e 17 2	+ 7	—	—
Honolulu E.	80.2	70	—	—	—	—	e 39.8	—
Tiflis	81.0	312	—	—	e 20 56	-99	—	—
Ielwan	91.0	300	e 16 15	?	23 50	-34	—	56.6
Vienna	100.8	321	e 18 7	?PR ₁	—	—	e 52.8	54.8
Cape Town	102.8	234	24 50	?S	(24 50)	-92	—	—
Hamburg	103.3	326	—	—	e 25 50	-37	e 53.8	—
Strasbourg	106.3	322	(e 20 50)	?PR ₁	—	—	e 20.8	—
De Bilt	106.6	326	—	—	e 26 28	-29	e 51.8	66.6
Uccle	107.5	325	e 19 2	?PR ₁	e 25 8	-118	e 53.8	62.7
Besançon	107.6	319	13 37	-69	—	—	43.8	—
Dyce	108.1	331	—	—	e 28 53	+102	52.7	56.9
Edinburgh	109.2	330	—	—	e 28 50	+89	53.8	—
Paris	109.4	324	e 13 18	-97	e 27 20	- 3	56.8	60.8
Eskdalemuir	109.5	330	e 17 50	[-30]	e 28 20	+56	51.8	—
Oxford	110.1	325	—	—	—	—	53.8	78.2
Granada	118.0	311	—	—	—	—	70.8	75.3
Chicago	130.1	29	—	—	—	—	e 63.8	—
Ottawa	131.8	15	—	—	—	—	e 63.8	—
Northfield	133.7	13	—	—	—	—	e 73.8	—
La Paz	160.4	148	20 10	[+ 2]	25 34	?PR ₁	29.6	—

Additional readings and notes: Manila gives also MN = +8.5m. Batavia
 is = +4m.19s. Kobe MN = +7.5m. Tokyo MN = +15.6m. Cal-
 cutta PN = +8m.12s. Tiflis e = +23m.26s. De Bilt MN = +57.3m.
 Dyce eN = +34m.33s. Paris MN = +57.8m. Ottawa L = +69.8m.
 and 73.8m.

Sept. 11d. Readings also at 2h. (Azores), 3h. (Manila), 4h. (Budapest), 10h. (near Mizusawa and Tokyo), 12h. (Manila, Batavia, Colombo, Honolulu, and Apia), 13h. (Vienna, Hamburg, Strasbourg, De Bilt, Uccle, Azores, Eskdalemuir, Vera Cruz, and near Tacubaya), 14h. (near Mizusawa), 16h. (Manila and Batavia), 17h. (Granada and near Tokyo), 18h. (Manila, Batavia, and Azores), 20h. (Apia (2), Rocca di Papa, Pompeii, and Vienna), 21h. (De Bilt, Uccle, and Eskdalemuir), 22h. (Eskdalemuir).

Sept. 12d. Readings at 11h. (Victoria, Chicago, Eskdalemuir, Uccle, Hong Kong, De Bilt, Honolulu, Toronto, Ottawa, and Tiflis), 14h. (Sydney and Manila), 18h. (La Paz), 21h. (near Mizusawa), 23h. (near Nagasaki). The 11h. readings suggest a repetition at 11h.35m.0s. from the epicentre 55°0N. 167°0E. on August 11.

Sept. 13d. Readings at 10h. (La Paz), 11h. (Tokyo), 15h. (Azores), 18h. (Hong Kong), 22h. (Azores), 23h. (Taihoku).

1922. Sept. 14d. 19h. 31m. 30s. Epicentre 25°0N. 121°5E.
 (as on Sept. 1d.).

A = - .472, B = + .773, C = + .423; D = + .853, E = + .522;
 G = - .221, H = + .360, K = - .906.

See note to Sept. 1.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	0.1	22	0 18	+16	—	—	—	—
Hokoto	2.6	231	0 40	- 1	—	—	1.1	1.2
Zi-ka-wei	6.2	359	1 34	- 1	e 3 10	?L	(e 3.2)	—
Hong Kong	7.1	249	1 50	+ 2	—	—	3.5	4.5
Manila	10.4	183	e 2 32	- 4	—	—	5.2	10.5
Nagasaki	10.7	42	2 41	+ 1	—	—	5.1	9.2
Kobe	15.3	48	3 51	+ 8	7 25	+46	9.5	11.2
Osaka	15.5	48	3 40	- 6	(6 48)	+ 4	6.8	10.4
Nagoya	16.8	49	3 55	- 7	—	—	10.6	11.2
Tokyo	19.0	51	i 4 29	0	8 11	+ 9	11.2	16.9
Mizusawa	E. 21.8	45	5 1	- 2	10 48	?L	(10.8)	—
Ootomari	27.5	33	4 54	-69	(11 35)	—	11.6	16.6
Calcutta	E. 30.3	273	6 28	- 3	11 38	- 1	16.5	19.2
N.	30.3	273	6 36	+ 5	11 53	+14	16.8	—

Continued on next page.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Batavia		34.3	207	6 52	-15	i 13 0	+16	e 19.7	—
Dehra Dun		38.5	288	9 30	?PR ₁	—	—	—	—
Simla	E.	39.2	290	7 24	-24	—	—	21.1	22.3
	N.	39.2	290	9 30	?PR ₁	—	—	20.6	—
Colombo		43.6	254	8 24	+1	18 24	?SR ₁	—	33.7
Kodaikanal		44.2	260	9 48	+81	—	—	19.0	30.3
Bombay		45.2	273	e 9 16	-42	—	—	25.3	28.1
Tiflis		64.0	307	e 11 1	+23	e 19 33	+20	34.5	41.6
Melbourne		66.6	160	11 54	+59	e 20 0	+15	32.1	44.5
Honolulu	N.	72.9	75	i 21 10	?S	(i 21 10)	+9	35.8	—
Upsala		75.1	330	12 1	-11	21 40	+13	e 39.7	46.8
Lemberg		75.6	319	—	—	e 21 54	+21	e 27.0	19.7
Konigsberg		75.6	325	12 4	+11	21 43	+10	e 37.0	42.5
Sitka		75.9	34	—	—	—	—	e 43.4	46.8
Helwan		77.9	297	12 20	+14	i 22 11	+12	—	49.2
Budapest		79.6	319	e 12 27	+10	e 22 34	+15	e 44.5	—
Belgrade		79.9	315	e 14 7	+109	e 26 57	?SR ₁	e 44.0	50.1
Vienna		80.8	320	e 12 25	+1	i 22 43	+10	e 39.0	48.6
Hamburg		81.8	327	e 12 28	-1	e 22 51	+7	e 40.5	45.5
Innsbruck		84.2	321	e 12 48	+5	—	—	e 46.5	—
Padova		84.9	319	—	—	23 24	+6	—	52.4
De Bilt		85.0	327	—	—	23 16	-3	41.5	48.1
Dyce	N.	85.1	334	—	—	i 23 28	+8	42.3	47.6
Strasbourg		85.6	323	e 13 0	-9	23 33	+7	e 41.5	48.7
Zurich		85.8	321	e 12 54	+2	23 32	+4	—	—
Florence		86.1	319	23 0	?S	(23 0)	-31	40.8	48.5
Uccle		86.1	326	e 12 57	+3	e 23 33	+2	e 41.5	48.4
Rocca di Papa	N.	86.3	315	e 10 42	-133	17 36	?PR ₁	e 44.6	56.4
Edinburgh		86.4	333	—	—	e 23 37	+3	43.5	57.2
Victoria		86.6	37	22 33	?S	28 57	?SR ₁	—	51.3
Eskdalemuir		86.8	333	e 13 0	+2	23 38	-1	41.5	47.8
Besançon		87.4	323	—	—	—	—	47.5	—
Stonyhurst		87.5	330	e 23 30	?S	(e 23 30)	-17	48.0	51.8
Moncalieri		87.6	320	i 13 16	+13	i 23 48	0	31.5	55.3
Bidston		88.0	330	21 50	?	24 55	+63	—	59.3
Kew		88.0	329	—	—	—	—	—	51.5
Oxford		88.3	329	i 13 8	+1	i 23 53	-2	44.0	56.9
Paris		88.3	325	—	—	—	—	30.5	58.5
Marseilles		89.9	320	e 16 30	?PR ₁	—	—	44.5	47.5
Barcelona		92.9	320	e 24 47	?S	(e 24 47)	+3	e 40.2	52.5
Tortosa	N.	94.3	321	—	—	—	—	e 20.5	62.0
Algiers		95.2	316	14 23	+39	e 24 55	-13	e 42.5	62.5
Granada		99.1	319	—	—	—	—	49.5	55.4
Coimbra	E.	99.8	325	e 9 50	?	21 50	?	47.8	56.0
	N.	99.8	325	e 9 30	?	22 50	-184	48.5	56.3
Rio Tinto		100.5	321	31 30	?	—	—	—	68.5
San Fernando		101.1	320	43 18	?L	—	—	(43.3)	59.6
Ottawa	E.	107.9	13	e 16 54	?	e 22 6	?	41.8	—
Chicago		108.0	22	16 0	+72	—	—	48.5	—
Toronto		108.7	15	—	—	e 23 42	?	64.9	—
Ann Arbor		108.8	20	—	—	—	—	59.4	—
Ithaca		110.5	14	—	—	—	—	54.5	—
Georgetown		113.8	15	e 16 30	+75	25 51	-129	58.0	—
Washington		113.8	15	—	—	(e 35 30)	?SR ₁	63.5	—
Cape Town		113.9	242	—	—	—	—	—	66.5
Merida		125.0	36	—	—	—	—	86.1	86.6
La Paz		167.7	49	20 17	[+3]	e 34 24	?	69.2	87.9

Additional readings : Manila gives also MN = +8.9m. Kobe MN = +10.9m.
 Osaka MN = +10.8m. Tokyo iPR₁N = +4m.55s., MN = +14.6m. Mizu-
 sawa PN = +5m.2s. Batavia i = +8m.28s. and +12m.19s. Tiflis
 e = +11m.17s., 24m.0s., +27m.9s., and +31m.22s., MN = +39.9m. Ooto-
 mari MN = +16.2m. Honolulu eN = +29m.40s. Upsala MN =
 +47.0m. Konigsberg MZ = +47.5m. Sitka MN = +47.3m. Buda-
 pest readings all increased by 4m. Belgrade PR₁N = +22m.32s., eLN =
 +43.2m., LE = +45.9m., LN = +46.1m. Vienna iPZ = +12m.33s.,
 iPR₁ = +16m.5s. Hamburg SR₂ = +32m.12s., MZ = +53.5m. De Bilt
 SR₁ = +29m.12s., MN = +48.0m. Dyce LN = +32.9m. Strasbourg
 SR₁? = +29m.30s.? eL = +44.5m., MN = +49.2m. Zurich i = +26m.3s.
 Uccle SR₁ = +29m.30s., MN = +47.9m. Rocca di Papa ePE = +10m.54s.,
 ePZ = +12m.48s. Eskdalemuir SR₁ = +29m.30s., SR₂ = +33m.0s., MN =
 +47.6m. Paris MN = +48.5m. Marseilles L = +42.5m. Algiers
 PR₁ = +18m.4s. San Fernando MN = +67.8m. Ottawa eLE =
 +29.5m. and 9 other L's. Toronto eL = +72.3m. Ann Arbor eL =
 +48.5m., L = +62.9m. Ithaca L = +57.5m. Georgetown eLN =
 +43.9m., LN = +59.0m. Washington readings given as eL and L.

Sept. 14d. Readings also at 6h. (Azores and near Manila), 17h. (Azores), 18h. (near Merida), 19 h. (Taihoku (2), Stonyhurst, and Budapest), 20h., 21h., and 22h. (near Taihoku).

Sept. 15d. 7h. 13m. 30s. Epicentre $45^{\circ}0'N$. $135^{\circ}0'E$. (as on 1921 May 4d.).

$$A = -\cdot500, B = +\cdot500, C = +\cdot707; \quad D = +\cdot707, E = +\cdot707; \\ G = -\cdot500, H = +\cdot500, K = -\cdot707.$$

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mizusawa	E.	7.4	220	1 55	+ 3	3 16	- 5	—	—
Tokyo		10.0	157	e 4 27	?S	(e 4 27)	- 2	(e 6.2)	6.6
Hamburg		70.9	329	—	—	—	—	e 44.5	—
Vienna	Z.	72.4	323	11 43	+11	—	—	—	—
De Bilt		73.8	330	—	—	e 44 30	?L	e 50.5	—
Uccle		75.1	330	—	—	—	—	e 43.5	—

De Bilt gives also $eLn = +47.5m$.

Sept. 15d. 16h. 11m. 10s. Epicentre $39^{\circ}0'N$. $0^{\circ}0'$.

$$A = +\cdot777, B = 000, C = +\cdot629.$$

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Alicante		0.8	-0 8	-20	—	—	—	—
Tortosa		1.9	0 27	- 2	—	—	0.9	1.2
Almeria		2.8	1 22	?L	—	—	(1.4)	—
Barcelona		3.0	0 52	+ 5	—	—	—	—
Toledo		3.2	0 41	- 9	—	—	—	—
Granada		3.4	0 54	+ 1	1 34	0	1.7	1.8
Malaga		4.2	1 10	+ 5	—	—	—	—

No additional readings.

Sept. 15d. Readings also at 0h. and 1h. (Taihoku), 2h. and 4h. (Taihoku and Zi-ka-wei), 13h. (Taihoku), 17h. (near Tokyo), 19h. (Colombo), 20h. (Taihoku (2) and Zi-ka-wei), 21h. (Zi-ka-wei and Athens).

Sept. 16d. 22h. 44m. 36s. Epicentre $25^{\circ}0'N$. $121^{\circ}5'E$. (as on Sept. 14d.).

$$A = -\cdot472, B = +\cdot773, C = +\cdot423; \quad D = +\cdot853, E = +\cdot522; \\ G = -\cdot221, H = +\cdot360, K = -\cdot906.$$

See Note to Sept. 1.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Taihoku		0.1	22	-0 3	- 5	—	—	0.3	—
Hokoto		2.6	231	0 51	+10	—	—	1.3	1.4
Zi-ka-wei		6.2	359	e 1 24	-11	e 3 0	+11	—	—
Manila		10.4	183	e 2 28	- 8	(4 53)	+13	4.9	7.2
Nagasaki		10.7	42	2 44	+ 4	—	—	6.4	—
Kobe		15.3	48	3 26	-17	—	—	7.3	12.0
Osaka		15.5	48	3 46	0	(6 55)	+11	6.9	13.4
Tokyo		19.0	51	e 5 3	+34	8 23	+21	11.8	15.1
Ootomari		27.5	33	5 47	-16	—	—	15.4	19.7
Calcutta	E.	30.3	273	9 40	?	13 45	?	17.8	19.8
Batavia		34.3	207	6 29	-38	—	—	21.4	—
Simla		39.2	290	13 24	?S	(13 24)	-30	22.0	—
Colombo		43.6	254	8 24	+ 1	17 54	?SR ₁	28.2	30.4
Kodaikanal		44.2	260	14 6	?S	(14 6)	-59	27.5	36.2
Bombay		45.2	273	e 11 26	?PR ₁	(18 41)	?SR ₁	18.7	28.2
Tiflis		64.0	307	e 15 12	?PR ₁	19 48	+35	e 35.8	42.7
Honolulu	E.	72.9	75	20 59	?S	(20 59)	- 2	36.8	47.9
Konigsberg	E.	75.6	325	—	—	—	—	e 41.4	47.4
	N.	75.6	325	—	—	—	—	e 40.5	42.4
Helwan		77.9	297	e 12 14	+ 8	22 8	+ 9	—	54.0
Bergen		80.1	334	—	—	—	—	99.4	—
Vienna		80.8	320	e 12 21	- 3	e 22 48	+15	e 42.2	53.9

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Hamburg	81.8	327	—	—	—	—	e 40.4	50.4
De Bilt	85.0	327	—	—	—	—	e 40.4	49.1
Strasbourg	85.6	323	—	—	e 24 24	+58	40.4	—
Uccle	86.1	326	e 13 0	+ 6	—	—	e 41.4	47.4
Florence	86.1	319	—	—	—	—	—	110.4
Rocca di Papa	86.3	315	e 17 48	?PR ₁	e 23 30	- 3	e 46.4	55.1
Edinburgh	86.4	333	—	—	—	—	43.4	48.3
Victoria	86.6	37	—	—	—	—	50.9	—
Eskdalemuir	86.8	333	—	—	e 23 58	+19	39.4	48.2
Besançon	87.4	323	—	—	—	—	48.4	—
Stonyhurst	87.5	330	e 28 24	?SR ₁	34 54	?	46.4	51.4
Moucalieri	87.6	320	e 11 37	-86	23 25	-23	e 37.9	50.9
Kew	88.0	329	—	—	—	—	—	54.4
Bidston	88.0	330	—	—	35 29	?	—	51.6
Oxford	88.3	329	—	—	—	—	41.4	49.6
Paris	88.3	325	—	—	—	—	e 48.4	49.4
Barcelona	92.9	320	—	—	—	—	e 50.4	53.8
Berkeley	93.3	45	—	—	—	—	e 68.5	—
Tortosa	N. 94.3	321	e 41 24?	—	—	—	e 48.4	64.9
Algiers	N. 95.2	316	—	—	—	—	e 54.4	62.4
Granada	N. 99.1	319	—	—	—	—	54.9	57.2
Coimbra	E. 99.8	325	e 23 54	?S	(23 54)	-120	49.4	56.6
	N. 99.8	325	—	—	—	—	48.4	59.1
Rio Tinto	100.5	321	60 24	?L	—	—	(60.4)	63.4
San Fernando	101.1	320	54 36?	?L	—	—	(54.6?)	60.9
Ottawa	107.9	13	—	—	29 24	+135	56.4	—
Chicago	108.0	22	—	—	e 42 52	?	54.1	—
Toronto	108.7	15	—	—	—	—	e 63.6	65.9
Ann Arbor	108.8	20	—	—	—	—	56.4	—
Ithaca	110.5	14	—	—	—	—	60.4	—
Washington	113.8	15	—	—	—	—	e 65.4	—
La Paz	167.7	49	20 16 [+ 2]	—	—	—	—	—

Additional readings: Manila gives also MN = +7.4m. Kobe MN = +10.2m.
 Osaka MN = +12.8m. Tokyo MN = +14.4m. Batavia i = +8m.57s.
 Simla PN = +11m.30s. Tiflis e = +28m.48s. Honolulu eE = +32m.49s.
 eN = +30m.26s., LE = +45.4m., MN = +32.2m. Hamburg MN =
 +45.4m., MZ = +53.4m. De Bilt MN = +49.2m. Victoria L =
 +59.5m. Eskdalemuir eSR₁ = +29m.48s., MN = +48.1m. Paris MN =
 +51.4m. Barcelona MN = +53.7m. Berkeley eZ? = +50m.12s.,
 eE = +60m.24s. Coimbra S = +33m.26s. San Fernando MN =
 +63.9m. Ottawa e? = +40m.24s., eL = +48.4m. Toronto eL =
 +74.2m.

Sept. 16d. Readings also at 0h. (Taihoku), 3h. (Taihoku and Zi-ka-wei), 4h. (Taihoku, Zi-ka-wei, and Granada), 6h. (Rocca di Papa), 12h. (Azores), 16h. (Algiers), 18h. (near Taihoku), 19h. (near Tacubaya), 20h. (Manila), 22h. (Coimbra), 23h. (near Taihoku and near Tacubaya).

1922. Sept. 17d. $\left\{ \begin{array}{l} 7h. 22m. 36s. (I) \\ 7h. 53m. 6s. (II) \\ 9h. 59m. 18s. (III) \end{array} \right\}$ Epicentre $25^{\circ}0N. 121^{\circ}5E.$
 (as on Sept. 16d.).

A = -.472, B = +.773, C = +.423; D = +.853, E = +.522;
 G = -.221, H = +.360, K = -.906.

See Note to September 1.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Taihoku	0.1	22	0 2	0	—	—	0.3	—
II	0.1	22	0 5	+ 3	—	—	—	—
III	0.1	22	0 18	+16	—	—	—	—
I Hokoto	2.6	231	0 45	+ 4	(1 9)	- 3	1.2	2.1
II	2.6	231	0 3	-38	—	—	0.4	0.8
III	2.6	231	0 38	- 3	(1 4)	- 8	1.1	1.3
I Zi-ka-wei	6.2	359	e 2 2	+27	e 3 20	?L	(e 3.3)	5.1
II	6.2	359	e 1 32	- 3	e 2 48	- 1	—	4.6
III	6.2	359	e 1 27	- 8	e 2 55	+ 6	—	4.7
II Hong Kong	7.1	249	3 34	?L	—	—	(3.6)	4.2
III	7.1	249	—	—	—	—	—	5.0

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
I	Manila	10.4	183	e 2 59	+23	—	—	5.3	—
II		10.4	183	e 3 44	+68	—	—	7.8	—
III		10.4	183	e 2 17	-19	—	—	5.6	6.0
I	Nagasaki	10.7	42	3 4	+24	—	—	6.5	—
III		10.7	42	2 45	+5	—	—	6.4	10.4
I	Kobe	15.3	48	—	—	—	—	e 7.1	10.8
II		15.3	48	—	—	—	—	e 7.2	10.6
III		15.3	48	—	—	5 36	-63	7.5	14.1
I	Osaka	15.5	48	2 54	-52	(6 8)	-36	6.1	15.1
II		15.5	48	3 38	-8	—	—	7.0	14.6
III		15.5	48	3 31	-5	—	—	7.0	13.0
I	Tokyo	19.0	51	e 5 12	+43	e 8 48	+46	e 12.0	15.4
I	Calcutta	E. 30.3	273	5 42	-49	11 8	-31	17.2	—
III		E. 30.3	273	5 16	-75	10 37	-62	17.3	—
I	Batavia	34.3	207	e 6 58	-9	—	—	e 20.4	—
II		34.3	207	e 6 32	-35	—	—	—	—
III		34.3	207	e 6 45	+22	—	—	e 55.8	—
I	Simla	N. 39.2	290	—	—	—	—	e 20.5	—
III		N. 39.2	290	—	—	—	—	e 19.8	—
I	Colombo	43.6	254	8 42	+19	17 12	?SR ₁	26.7	29.7
III		43.6	254	10 0	+97	18 18	?SR ₁	—	—
I	Kodaikanal	44.2	260	17 42	?SR ₁	—	—	—	—
II		44.2	260	16 48	?	—	—	23.9	30.2
I	Bombay	45.2	273	e 18 53	?SR ₁	—	—	—	—
III		45.2	273	e 15 5	?S	(e 15 5)	-13	—	—
I	Tiflis	64.0	307	e 7 12	?	e 12 48	?PR ₁	32.4	45.9
III	Sydney	65.4	153	16 18	?	—	—	38.2	43.3
III	Melbourne	66.6	160	—	—	—	—	25.4	44.1
I	Honolulu	E. 72.9	75	21 22	?S	(21 22)	+21	34.8	38.1
III		N. 72.9	75	—	—	—	—	e 35.4	37.9
I	Konigsberg	E. 72.9	75	21 1	?S	(21 1)	0	e 36.7	43.4
III		N. 72.9	75	—	—	—	—	e 43.3	48.4
I	Helwan	75.6	325	—	—	—	—	e 43.9	48.7
III		75.6	325	—	—	—	—	—	—
I	Vienna	77.9	297	e 12 31	+25	22 7	+8	—	54.4
III		77.9	297	12 7	+1	22 0	+1	—	54.2
II	Hamburg	80.8	320	e 12 7	-17	—	—	—	23.6
III		80.8	320	i 12 26	+2	22 36	+3	—	54.2
I	De Bilt	81.8	327	—	—	—	—	e 40.4	53.4
III		81.8	327	—	—	—	—	—	52.9
I	Dyce	81.8	327	—	—	—	—	e 41.7	52.7
III		81.8	327	—	—	—	—	e 44.4	54.9
I	Strasbourg	E. 85.0	327	—	—	23 36	+17	e 42.4	56.0
III		N. 85.0	327	—	—	—	—	e 43.9	54.4
I	Edinburgh	E. 85.0	327	—	—	—	—	e 42.9	55.5
III		N. 85.0	327	—	—	—	—	e 42.7	54.6
I	Uccle	85.0	327	—	—	23 20	+1	e 46.4	55.4
III		85.0	327	—	—	—	—	47.7	55.7
I	Pompeii	N. 85.1	334	—	—	—	—	48.4	—
III		N. 85.1	334	—	—	—	—	—	—
I	Florence	85.6	323	—	—	—	—	—	—
III		85.6	323	e 12 47	-4	e 23 29	+3	48.7	55.7
I	Uccle	85.6	313	e 15 14	?	—	—	—	—
III		85.6	313	—	—	—	—	—	55.4
I	Rocca di Papa	86.1	319	—	—	—	—	—	67.7
III		86.1	319	—	—	—	—	—	—
I	Edinburgh	86.1	326	—	—	c 23 48	+17	e 42.4	57.1
III		86.1	326	e 18 42	?PR ₁	—	—	e 43.7	56.7
I	Stonyhurst	86.3	315	e 14 18	+83	—	—	e 43.7	59.2
III		86.3	315	12 54	-1	e 23 24	-9	e 53.5	71.0
I	Victoria	86.4	333	—	—	—	—	48.4	56.4
III		86.4	333	—	—	—	—	47.7	56.2
I	Eskdalemuir	86.6	37	—	—	—	—	52.2	—
III		86.6	37	—	—	—	—	44.9	58.8
I	Besançon	86.8	333	—	—	e 23 24	-15	44.4	56.5
III		86.8	333	—	—	—	—	44.9	—
I	Moncalieri	86.8	333	—	—	e 23 17	-22	43.7	55.5
III		86.8	333	—	—	—	—	51.7	—
I	Kew	87.4	323	e 13 62	+5	—	—	—	—
III		87.4	323	e 23 54	?S	(e 23 54)	+7	—	58.4
I	Bidston	87.5	330	e 23 24	?S	(e 23 24)	-24	49.4	56.6
III		87.5	330	(12 55)	-8	12 55	?P	22.7	57.7
I	Paris	88.0	329	—	—	—	—	—	59.4
III		88.0	329	—	—	—	—	—	57.7
I	Oxford	88.0	330	—	—	49 12?	?L	(49.2?)	59.3
III		88.0	330	—	—	—	—	—	39.0
I	Barcelona	88.3	325	—	—	e 17 14	?PR ₁	47.7	55.7
III		88.3	325	—	—	23 49	-6	46.8	57.2
I	Stonyhurst	88.3	329	—	—	23 34	-21	46.7	58.1
III		88.3	329	—	—	—	—	e 52.4	62.4
I	Barcelona	92.9	320	—	—	—	—	e 52.6	60.5
III		92.9	320	—	—	—	—	—	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
I Tortosa	N.	94.3	321	—	—	—	—	e 50.4	—
III	N.	94.3	321	—	—	—	—	e 51.7	56.6
I Algiers		95.2	316	—	—	—	—	e 56.4	61.4
III		95.2	316	—	—	—	—	e 56.7	63.7
III Granada		99.1	319	—	—	—	—	54.7	47.2
I Coimbra	E.	99.8	325	e 9 33	?	24 39	-75	48.4	65.9
I	N.	99.8	325	14 51	+41	—	—	50.4	65.6
III		99.8	325	10 35	?	24 21	-93	e 50.7	66.9
I Rio Tinto		100.5	321	60 24	?L	—	—	(60.4)	68.4
I San Fernando		101.1	320	—	—	—	—	—	66.2
III		101.1	320	56 12	?L	—	—	(56.7)	65.2
I Ottawa		107.9	13	—	—	e 49 24	?L	57.4	—
III		107.9	13	—	—	e 26 24	-45	e 56.7	—
I Chicago		108.0	22	—	—	—	—	e 51.4	—
III		108.0	22	27 55	?S	(27 55)	+45	51.7	—
I Toronto		108.7	15	—	—	—	—	63.8	—
III		108.7	15	—	—	—	—	63.5	73.6
I Ann Arbor		108.8	20	—	—	e 49 24	?L	e 57.4	—
III		108.8	20	—	—	—	—	59.7	—
III Ithaca		110.5	14	—	—	—	—	64.7	—
I Washington		113.8	15	—	—	—	—	e 72.4	—
I La Paz		167.7	49	89 7	?L	—	—	(89.1)	—
III		167.7	49	19 25	[-49]	—	—	—	—

Additional readings and notes: Zi-ka-wei I gives also MN = +4.4m., II MN = +3.8m. Kobe readings I, II, and III diminished by 30m. I MN = +11.1m. II MN = +9.4m., III MN = +14.7m. Osaka I MN = +14.7m., II MN = +13.6m., III MN = +13.6m. Tokyo I MN = +15.3m. Batavia I i = +8m.24s. Tiflis I e = +20m.24s., MN = +41.7m. Melbourne III e = 9h.52m.36s. Honolulu III SR,N = +31m.0s., LN = +35.0m., MN = +46.3m. Konigsberg I eN = +40m.39s., III eN = +39m.42s. Vienna II i = +15m.45s., III i = +22m.45s., PS = +23m.19s. De Bilt III MN = +55.8m. Strasbourg III MN = +57.3m. Strasbourg I L increased by 1h. Rocca di Papa III PV = +13m.6s., iP = +13m.54s. Victoria I L = +60.7m. Eskdalemuir III e = +29m.42s. and +33m.42s., MN = +56.4m. Moncalieri I S = +34m.35s., III P? = 9h.58m.22s. Bidston III P = 9h.52m.20s., S = 9h.54m.20s. Coimbra III eP? = +15m.31s., MN = +65.8m. San Fernando I MN = +67.7m., III MN = +67.5m. Ottawa III e = +28m.12s. and +41m.42s., eL = +44.7m. Toronto I L = +67.0m. and +96.1m., III L = +71.6m., eL = +81.6m. Ithaca III L = +72.7m.

Sept. 17d. Readings also at 1h. (Taihoku (2), Hokoto, and Zi-ka-wei (2)), 2h. (De Bilt, Uccle, and near Zurich), 3h. (Vienna and Azores), 4h. (Lick), 5h. (Zi-ka-wei and near Hokoto and Taihoku), 6h. (near Tokyo), 7h. (near Taihoku), 9h. (Nagoya, Zi-ka-wei (2), Pilar, Tokyo, Taihoku (2), and near Berkeley), 10h. (Taihoku (2) and Cipolletti), 11h. (Zi-ka-wei (2), Taihoku, Cipolletti, Budapest, and near Hokoto), 12h. (Strasbourg, Taihoku (2), Zi-ka-wei, and near Hokoto), 17h. (La Paz), 21h. (near Taihoku), 22h. (De Bilt, Zi-ka-wei, Hong Kong, Eskdalemuir, Kew, and near Hokoto), 23h. (Dyce).

Sept. 18d. 6h. 20m. 0s. Epicentre 25°-0N. 121°-5E. (as on 17d.).

See Note to Sept. 1.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku		0.1	22	0 0	- 2	—	—	0.2	0.3
Zi-ka-wei		6.2	359	e 1 38	+ 3	e 3 2	+13	—	5.3
Hong Kong		7.1	249	2 30	+42	—	—	—	4.5
Manila		10.4	183	e 2 4	-32	—	—	—	—
Nagasaki		10.7	42	2 41	- 1	—	—	—	—
Colombo		43.6	254	23 12	?L	—	—	(23.2)	—
Hamburg		81.8	327	—	—	—	—	e 43.0	55.0
De Bilt	E.	85.0	327	—	—	—	—	e 46.0	47.8
	N.	85.0	327	—	—	—	—	e 45.0	55.7
Strasbourg		85.6	323	—	—	—	—	e 50.5	—
Uccle		86.1	326	—	—	—	—	e 45.0	—
Rocca di Papa		86.3	315	—	—	—	—	e 49.2	61.8
Edinburgh		86.4	333	—	—	—	—	e 49.0	—
Eskdalemuir		86.8	333	—	—	e 23 30	- 9	e 43.5	56.0
Kew		88.0	329	—	—	—	—	—	58.0
Bidston		88.0	330	—	—	—	—	—	59.0
Paris		88.3	325	—	—	e 47 0	?L	55.0	57.0
Oxford		88.3	329	—	—	—	—	—	57.9

Additional readings: Zi-ka-wei gives also MN = +5.2m. Eskdalemuir eE = +29m.30s.

Sept. 18d. Readings also at 0h. (near Tokyo), 2h. (Taihoku), 9h. (Tifis and Azores), 10h. (near Taihoku), 12h. (Chicago, Honolulu, and near Berkeley), 16h. (Innsbruck), 17h. (Azores), 21h. (near Tokyo).

Sept. 19d. 3h. 16m. 20s. (I) / Epicentre $18^{\circ}0'S$. $73^{\circ}0'W$. (as on 1913 Aug. 6d.).
23h. 50m. 0s. (II) /

$A = +.278$, $B = -.910$, $C = -.309$; $D = -.956$, $E = -.292$;
 $G = -.090$, $H = +.296$, $K = -.951$.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
I	La Paz	4.9	70	i 1 23	+ 7	i 2 27	+13	2.8	3.2
II		4.9	70	i 1 22	+ 6	i 2 25	+11	2.7	4.1
I	La Quiaca	E. 8.0	122	1 10	-51	(3 54)	+17	3.6	4.6
II		E. 8.0	122	—	—	—	—	4.5	5.3
I	Andalgala	E. 11.4	149	0 4	?	—	—	0.5	1.2
I		N. 11.4	149	-0 2	?	—	—	0.5	1.3
II		E. 11.4	149	-0 18	?	—	—	0.4	1.5
II		N. 11.4	149	—	—	—	—	0.5	1.6
I	Mendoza	15.5	165	7 34	?L	—	—	9.1	10.1
II		15.5	165	8 18	?L	—	—	8.8	10.1
I	Pilar	E. 16.0	151	6 4	?	(6 58)	+ 3	7.0	7.3
I		N. 16.0	151	5 58	?	(7 4)	- 9	7.1	7.7
II		E. 16.0	151	7 6	?S	(7 6)	+11	7.6	8.8
II		N. 16.0	151	7 6	?S	(7 6)	+11	7.8	10.7
II	Chacareta	E. 21.1	145	8 18	?S	(8 18)	-28	14.7	24.6
II		N. 21.1	145	8 12	?S	(8 12)	-34	14.6	24.5
I	Cipolletti	21.4	169	10 58	?L	—	—	13.1	14.2
II		21.4	169	15 18	?L	—	—	16.0	21.0
I	Uccle	96.2	38	—	—	—	—	—	51.7
I	De Bilt	E. 97.1	37	—	—	—	—	e 52.7	—
I	Strasbourg	97.4	41	—	—	—	—	e 29.7	—
II		97.4	41	—	—	—	—	e 68.0	—

Additional readings: De Bilt i gives also eLN = +53.7m.

Sept. 19d. Readings also at 0h. (Port au Prince), 1h. (near La Paz), 2h. (near La Paz (2) and Taihoku), 3h. (La Paz and near Taihoku), 4h. (La Paz), 6h. (near Tacubaya), 7h. (La Paz), 8h. (Vienna), 9h. (La Paz), 10h. (near Tokyo and near Tacubaya), 11h. and 13h. (near Zurich), 15h. (La Paz), 16h. (Algiers), 17h. (La Paz and Zurich), 18h. (near Batavia), 21h. (near Batavia and near La Paz).

Sept. 20d. 12h. 32m. 8s. Epicentre $43^{\circ}8'N$. $11^{\circ}2'E$. (as on 1922 Aug. 2d.).

$A = +.708$, $B = +.140$, $C = +.692$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Florence	0.0	—	0 18	+18	—	—	—	0.4
Padova	1.7	17	0 27	+ 1	0 44	- 4	—	—
Rocca di Papa	2.3	152	—	—	—	—	e 1.3	2.0
Innsbruck	3.5	2	—	—	e 1 23	-14	—	—
Zurich	4.0	332	i 0 57	- 5	i 1 50	0	—	—
Strasbourg	5.3	334	e 2 7	?S	(e 2 7)	-18	e 2.9	—

Innsbruck readings decreased by 1h. Zurich gives also i = +1m.6s.

Sept. 20d. Readings also at 3h. (La Paz and near Vera Cruz), 5h. (Batavia), 8h. (La Paz), 9h. (Zi-ka-wei), 13h. (Taihoku), 16h. (near Tokyo and near Tacubaya), 17h., 18h. (2), and 19h. (La Paz), 21h. (Zi-ka-wei, Taihoku, and La Paz), 22h. (Manila), 23h. (near Granada).

Sept. 21d. Readings at 0h. (Azores), 1h. (La Paz), 3h. and 4h. (La Paz), 6h. (Taihoku), 10h. (Batavia), 11h. (Algiers), 15h. (near Manila), 16h. (near Taihoku), 17h. (Azores), 20h. (Azores, Malaga, and near Granada), 21h. (near Tokyo), 22h. (Granada, near Taihoku, Hong Kong, and Zi-ka-wei), 23h. (Granada and Azores).

Sept. 22d. 18h. 13m. 45s. Epicentre $34^{\circ}5'N$. $25^{\circ}0'E$. (as on 1922 Mar. 8d.).

A = +.747, B = +.348, C = +.566 : D = +.423, E = -.906 ;

G = +.513, H = +.239, K = -.824.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	3.6	344	e 1 0	+ 4	1 38	- 1	e 1.8	2.3
Pompeii	10.3	310	e 3 40	+66	—	—	—	—
Rocca di Papa	12.1	310	e 3 3	+ 3	—	—	—	8.4
Strasbourg	19.0	323	e 3 28	-61	—	—	e 12.8	—
Uccle	22.1	324	e 5 3	- 3	—	—	e 12.0	—
De Bilt	22.6	327	—	—	e 9 15	- 2	—	13.4
Granada	23.2	285	i 5 12	- 7	—	—	—	—
Eskdalemuir	28.5	326	—	—	—	—	e 14.2	—

Additional readings. Athens gives also ePE = -1m.6s., MN = +2.7m. Rocca di Papa ePN = +3m.33s. Granada i = +5m.34s. and +5m.40s.

Sept. 22d. 21h. 25m. 30s. Epicentre $27^{\circ}0'N$. $42^{\circ}0'W$.

A = +.662, B = -.596, C = +.454 : D = -.669, E = -.743 ;

G = +.337, H = -.304, K = -.891.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Coimbra	30.7	56	e 6 30	- 5	e 11 48	+ 2	14.8	—
Tortosa N.	37.5	58	7 30	- 4	13 30	- 1	—	18.2
Algiers	39.1	65	e 7 51	+ 4	e 14 0	+ 7	21.5	—
Eskdalemuir	39.8	34	—	—	e 13 57	- 6	e 16.9	—
Chicago	39.9	304	12 30	?S	(12 30)	-95	18.5	—
Uccle	42.3	44	—	—	e 14 37	- 2	e 20.5	—
De Bilt	43.0	41	—	—	e 14 50	+ 2	e 20.5	21.6
Strasbourg	43.8	47	e 8 30	+ 6	e 15 3	- 4	e 22.5	—
Rocca di Papa	46.7	58	e 8 54	+ 9	(e 14 36)	-61	e 14.6	15.1
La Paz	50.4	214	8 22	-47	—	—	27.9	—

Additional readings and notes : Coimbra gives also eLN = -13.5m. De Bilt eLN = +19.5m.

The above determination is made on the hypothesis that the focus is of normal depth, and that the La Paz and Chicago readings are in some way erroneous. A determination in which these assumptions are not made is as follows :—

Sept. 22d. 21h. 25m. 30s. Epicentre $25^{\circ}2'N$. $46^{\circ}6'W$.

A = +.622, B = -.657, C = +.426 : D = -.727, E = -.687 ;

G = +.293, H = -.309, K = -.905.

A depth of focus 0.045 is assumed in order to reconcile the La Paz observation with those in Europe.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°		m. s.	s.	m. s.	s.	m.	m.
Coimbra	3.3	35.1	54	e 6 30	-15	e 11 48	-17	14.8	—
Chicago	-3.4	37.1	307	12 30	?S	12 30	- 6	18.5	—
Tortosa N.	-3.7	41.9	55	7 30	-10	13 30	-11	—	18.2
Eskdalemuir	-3.9	43.5	34	—	—	e 13 57	- 3	e 16.9	—
Algiers	-3.9	43.6	61	e 7 51	- 1	e 14 0	- 2	21.5	—
Uccle	-4.1	46.3	42	—	—	e 14 37	- 1	e 20.5	—
La Paz	-4.2	46.7	210	8 22	- 7	—	—	27.9	—
De Bilt	-4.2	47.1	41	—	—	e 14 50	+ 3	e 20.5	21.6
Strasbourg	-4.2	48.0	46	e 8 30	+ 6	e 15 3	- 4	e 22.5	—
Rocca di Papa	-4.5	51.0	55	e 8 54	+10	(e 14 36)	-59	e 14.6	15.1

Additional readings : Coimbra gives also eLN = +13.5m. De Bilt eLN = +19.5m.

Sept. 22d. Readings also at 1h. (Zi-ka-wei and Hong Kong), 2h. (Granada), 4h. (Azores and Manila), 5h. (Granada), 6h. and 10h. (Azores), 15h. (La Paz), 20h. (Berkeley).

Sept. 23d. 0h. 53m. 40s. Epicentre $40^{\circ}5'N$. $4^{\circ}0'E$.

A = +.758, B = +.053, C = +.649 ; D = +.070, E = -.998 ;
G = +.648, H = +.045, K = -.760.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Barcelona		1.7	302	i 0 26	0	—	—	i 0.8	—
Tortosa	N.	2.6	277	0 44	+ 3	—	—	1.3	—
Marseilles		3.0	20	0 42	- 5	1 12	-11	—	—
Puy de Dôme		5.1	353	1 0	-23	—	—	—	—
Granada		6.8	243	i 3 43	?L	i 4 22	?	4.4	4.5
Besançon		6.8	12	2 41	?S	(2 41)	-24	—	—
Zurich		7.6	25	e 1 53	- 2	i 3 33	+ 7	—	—
Paris		8.4	354	—	—	—	—	e 4.3	—
Strasbourg		8.5	17	—	—	e 3 46	- 4	(e 4.1)	—
Uccle		10.3	2	e 3 14	+40	—	—	—	—
Eskdalemuir		15.6	344	—	—	—	—	7.3	—

Additional readings: Zurich gives also eV = +1m.33s.
+3m.44s., eL is given as eS?

Strasbourg e? =

Sept. 23d. 6h. 37m. 10s. Epicentre $36^{\circ}5'N$. $140^{\circ}5'E$. (as on 1920 Dec. 2d.).

A = -.620, B = +.511, C = +.595.

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tokyo		1.1	i 0 16	- 1	i 0 28	- 3	—	0.5
Mizusawa	E.	2.6	0 41	0	1 14	+ 2	—	—
Nagoya		3.2	0 48	- 2	—	—	1.5	2.3
Osaka		4.5	1 1	- 9	—	—	2.2	3.2
Kobe		4.7	e 1 21	+ 8	—	—	2.4	3.0
Zi-ka-wei	Z.	16.7	e 4 10	+ 9	—	—	—	10.1

Additional readings: Mizusawa gives also SN = +1m.15s.
+3.1m. Kobe MN = +2.6m.

Osaka MN =

Sept. 23d. Readings also at 15h. (La Paz and Taihoku), 18h. (Rocca di Papa and near Tokyo), 21h. (Bidston and Granada), 22h. (Taihoku).

Sept. 24d. 12h. 26m. 0s. Epicentre $75^{\circ}0'N$. $100^{\circ}0'E$.

A = -.045, B = +.255, C = +.966 ; D = +.985, E = +.174 ;
G = -.168, H = +.951, K = -.259.

Very doubtful.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Dyce	N.	38.5	303	i 11 15	?	i 14 10	+25	—	21.0
Hamburg		39.0	290	e 15 13	?S	(e 15 13)	+81	e 23.0	—
Edinburgh		40.0	302	—	—	i 13 54	-13	18.5	20.5
Eskdalemuir	E.	40.5	302	e 7 45	-14	—	—	12.0	19.5
	N.	40.5	302	i 11 19	?PR ₁	—	—	i 17.5	22.3
De Bilt		41.5	291	—	—	e 15 0	+32	21.0	23.9
Bidston		42.2	298	—	—	14 37	- 1	—	21.0
Uccle		42.9	291	—	—	e 14 54	+ 7	e 21.0	—
Kew		43.4	297	—	—	—	—	—	22.0
Oxford		43.4	299	—	—	—	—	18.3	21.0
Strasbourg		44.2	289	e 15 21	?S	(e 15 21)	+16	e 24.0	—
Moncalieri		47.5	285	—	—	e 18 0	?SR ₁	19.4	—
Rocca di Papa		49.3	280	e 9 54	+52	e 16 12	+ 2	—	—
Coimbra		55.9	300	3 54	?	11 36	?PR ₁	20.2	—
Algiers		56.4	287	—	—	e 19 11	+92	e 25.0	26.5

Additional readings: Eskdalemuir gives also iE = +13m.56s. Strasbourg
eS = +20m.30s. Rocca di Papa eSE = +15m.30s., eSN = +16m.0s.

Sept. 24d. Readings also at 2h. (Zi-ka-wei and near Taihoku), 7h. (Granada and near Kobe), 8h. (near Tacubaya), 14h. (La Paz (2)), 18h. (Zi-ka-wei, near Taihoku, and near Tacubaya), 19h. (Zi-ka-wei and near Taihoku), 22h. (near Tacubaya).

Sept. 25d. Readings at 5h. (near Manila), 8h. (Zi-ka-wei), 9h. (Mizusawa), 12h. (Tortosa), 13h. (Granada, Almeria, and Mala a), 14h. (Malaga (2) and near Granada), 15h. (Nagoya and near Osaka and Kobe), 23h. (near Tacubaya).

Sept. 26d. Readings at 2h. (Pompeii and Rocca di Papa), 5h. (Zi-ka-wei), 7h. (Taihoku and Zi-ka-wei), 11h. (Tiflis), 12h. (Batavia), 14h. (near Manila and near Taihoku), 19h. (Rio Tinto and near Tacubaya).

Sept. 27d. Readings at 7h. (near Taihoku), 9h. (Zi-ka-wei), 23h. (Zi-ka-wei (2) and Colombo).

Sept. 28d. 22h. 1m. 5s. Epicentre $39^{\circ}2'N$. $120^{\circ}5'E$.

A = -393, B = +668, C = +632 ; D = +862, E = +508 ;
G = -321, H = +545, K = -775.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Zi-ka-wei		8.0	174	e 2 1	0	e 3 37	0	—	6.4
Kobe		12.6	106	0 51	?	—	—	10.2	16.8
Taihoku		14.2	177	2 37	-52	—	—	2.8	—
Tokyo		15.7	97	—	—	6 46	- 2	—	—
Hong Kong		17.7	200	4 13	0	—	—	—	7.4
Manila		24.6	179	e 5 35	+ 1	—	—	—	—
Hamburg		69.7	324	—	—	—	—	e 45.9	47.9
De Bilt	E.	72.9	325	—	—	—	—	e 45.9	51.7
	N.	72.9	325	—	—	—	—	e 44.9	50.2
Edinburgh		73.6	331	—	—	—	—	48.9	54.9
Strasbourg		74.0	321	—	—	—	—	49.9	—
Eskdalemuir		74.0	331	—	—	—	—	46.9	51.0
Uccle		74.1	325	—	—	—	—	e 47.9	50.9
Stonyhurst		74.8	329	e 16 55	?PR ₁	—	—	—	53.9
Florence		75.4	316	—	—	—	—	43.2	53.0
Kew		75.6	327	—	—	—	—	—	57.9
Oxford		75.9	327	—	—	—	—	48.4	58.9
Moncalieri		76.4	318	—	—	e 40 22	?L	48.6	—

Additional readings and notes : Zi-ka-wei eP has been diminished by 2m., MN = +6.2m. Kobe MN = -15.4m.

Sept. 28d. Readings also at 1h. (near Zurich), 4h. (Batavia, Zante (2), and Pompeii), 5h. (near Tokyo), 12h. (near Mizusawa), 16h. and 17h. (near La Paz), 20h. (Stonyhurst).

Sept. 29d. 18h. 44m. 35s. Epicentre $42^{\circ}5'N$. $89^{\circ}3'E$.

A = +009, B = +737, C = +676 ; D = +1000, E = -012 ;
G = +008, H = +676, K = -737.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Simla	N.	15.0	224	e 3 37	- 2	—	—	—	—
Calcutta	E.	20.0	183	4 41	0	8 24	+ 1	12.0	—
Tiflis		32.6	282	—	—	e 10 39	-99	e 15.6	18.2
Kodakanal		33.9	202	16 13	?L	—	—	(16.2)	—
Colombo		36.6	197	12 55	?S	(12 55)	-23	—	21.4
Lemberg		44.3	303	—	—	e 14 13	-53	e 20.7	22.5
Konigsberg		45.0	312	—	—	—	—	i 16.9	22.7

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Vienna	49.6	305	e 8 4	-60	—	—	i 24.5	27.9
Bergen	51.3	322	—	—	—	—	25.6	—
Hamburg	51.3	312	—	—	—	—	i 24.8	28.9
De Bilt	E. 54.6	311	—	—	—	—	e 26.4	32.2
	N. 54.6	311	—	—	—	—	e 25.4	28.4
Strasbourg	54.7	309	—	—	e 26 25	?L	(e 26.4)	—
Rocca di Papa	54.7	298	i 18 1	?S	(i 18 1)	+44	26.1	30.4
Uccle	55.6	310	—	—	—	—	e 25.4	—
Moucalieri	56.4	303	e 13 23	?PR ₁	19 47	+128	28.9	—
Edinburgh	57.2	319	—	—	—	—	28.4	29.4
Eskdalemuir	57.5	319	—	—	—	—	25.4	29.4
Kew	57.9	313	—	—	—	—	—	33.4
Oxford	58.3	313	—	—	—	—	28.3	33.4
Bidston	58.4	315	—	—	25 27	?L	(25.4)	35.1
Coimbra	68.9	306	—	—	32 5	?	35.9	—
Ottawa	E. 91.1	350	—	—	—	—	e 44.4	—
Chicago	95.6	357	45 20	?L	—	—	e 51.4	—

Additional readings : Calcutta gives also SN = +8m.22s. Tiflis e = +14m.10s.
[e] = +18m.30s., [L] = +23.5m. Vienna eN = +10m.16s., iE = +21m.32s.,
and +22m.33s. Bergen e = +21m.45s. Hamburg e = +19m.25s.,
MN = +27.7m., MZ = +29.4m. De Bilt eE = +20m.1s. Strasbourg
e = +19m.36s. Uccle e = +20m.13s. Eskdalemuir e = +21m.0s.,
MN = +60.5m. Coimbra e = +27m.5s. Ottawa LE = +48.9m.

Sept. 29d. 21h. 29m. 0s. Epicentre 15°.5N. 101°.2W. (as on 1922 April 20d.).

A = -.187, B = -.945, C = +.267 ; D = -.981, E = +.194 ;
G = -.052, H = -.262, K = -.964.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Colima	3.6	318	0 31	-25	—	—	1.5	1.7
Tacubaya	4.3	25	1 16	+ 9	(1 46)	-12	1.8	1.9
Oaxaca	4.5	69	1 39	+29	—	—	2.4	2.8
Puebla	4.5	38	1 40	+30	—	—	2.2	2.5
Vera Cruz	6.1	52	2 12	?S	(2 12)	-34	3.3	3.4
Mazatlan	9.1	329	3 8	+50	—	—	4.7	4.9
Merida	12.3	62	3 21	+18	—	—	5.3	6.0
Tucson	18.9	334	—	—	—	—	i 10.1	11.0
Denver	24.4	353	—	—	—	—	11.0	—
Chicago	28.8	21	6 12	- 4	10 50	-23	—	—
Berkeley	29.1	324	—	—	e 12 21	+62	e 14.9	—
Ann Arbor	30.7	27	—	—	—	—	i 13.0	—
Georgetown	31.6	38	—	—	e 11 48	-13	e 28.0	—
Washington	31.6	38	5 43	-60	12 42	+41	—	—
Toronto	33.7	30	—	—	—	—	e 15.1	16.4
Ithaca	34.3	35	—	—	—	—	e 14.0	—
Ottawa	36.7	31	13 0	?S	(13 0)	-20	e 22.0	—
Victoria	37.6	337	17 27	?SR ₁	—	—	19.0	21.4
Granada	86.5	53	(12 58)	+ 2	—	—	13.0	—
De Bilt	E. 87.4	36	—	—	—	—	e 52.0	—
Uccle	87.5	38	—	—	—	—	—	49.0
Taihoku	121.9	314	67 7	?L	—	—	(67.1)	—
Colombo	157.6	357	44 30	?SR ₁	—	—	—	66.0

Additional readings and notes : Colima readings have been increased by 1m. ; possibly they refer to an earlier shock. Puebla readings have been diminished by 7m. Merida gives also PZ = +3m.18s. Tucson MN = +10.4m. Toronto L = 21h.16m.48s. and 21h.43m.18s. Ithaca e = +20m.0s. Ottawa i = +20m.45s., L = +23.5m.

Sept. 29d. Readings also at 1h. (Tortosa), 3h. (Tiflis), 4h. (near Osaka), 6h. (La Paz), 18h. (Malaga and near Granada), 20h. (near Tacubaya), 21h. (La Paz and near Tacubaya), 22h. (near Malaga, also near Colima, Tacubaya, Vera Cruz, and Taihoku), 23h. (Strasbourg).

Sept. 30d. 23h. 35m. 6s. Epicentre $32^{\circ}2'N$. $110^{\circ}1'W$. (as on 1920 June 1d.).

$A = -.291$, $B = -.794$, $C = +.533$; $D = -.939$, $E = +.344$;

$G = -.183$, $H = -.500$, $K = -.846$.

Very rough.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tucson	0.6	275	i 0 6	- 3	—	—	—	0.4
Denver	8.5	28	—	—	—	—	8.9	—
Berkeley	11.5	302	—	—	e 4 13	-54	—	—
Chicago	20.2	55	—	—	7 21	-66	—	—
Georgetown N.	27.5	66	—	—	e 11 2	-12	—	—
Washington	27.5	66	—	—	e 11 43	-53	—	—
Ithaca	28.4	59	—	—	e 11 24	-18	—	—
Ottawa	29.5	53	—	—	i 11 45	-19	—	—

Additional readings: Tucson gives also eN = 23h.35m.3s.
+ 6m.58s. Georgetown eE = + 11m.5s.

Chicago e =

Sept. 30d. Readings also at 0h. (near Belgrade), 3h. (2), 4h., and 5h. (near Tacubaya), 8h. (Honolulu, Mendoza, Cipolletti, Pilar, and Tacubaya), 9h. (La Paz), 11h. (near Mizusawa), 18h. (La Paz), 19h. (Stonyhurst and near Merida), 20h. (near Taihoku), 22h. (near La Paz).

TABLE.

De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.
1	15	28	13	51	553	991	438	101	855	1565	710
2	31	55	24	52	560	1004	444	102	860	1575	715
3	47	83	36	53	566	1016	450	103	865	1584	719
4	62	110	48	54	573	1029	456	104	870	1593	723
5	77	137	60	55	579	1041	462	105	874	1602	728
6	92	164	72	56	586	1054	468	106	879	1612	733
7	106	190	84	57	592	1066	474	107	884	1621	737
8	121	217	96	58	599	1079	480	108	888	1630	742
9	136	243	107	59	605	1091	486	109	893	1639	746
10	150	269	119	60	612	1103	491	110	897	1648	751
11	164	294	130	61	619	1116	497	111	902	1657	755
12	179	319	140	62	625	1128	503	112	907	1666	759
13	193	344	151	63	632	1141	509	113	911	1674	763
14	206	368	162	64	638	1153	515	114	916	1682	766
15	219	392	173	65	645	1165	520	115	920	1690	770
16	232	415	183	66	651	1177	526	116	925	1698	773
17	245	438	193	67	658	1190	532	117	929	1706	777
18	257	460	203	68	664	1202	538	118	934	1714	780
19	269	482	213	69	671	1214	543	119	938	1722	784
20	281	503	222	70	677	1226	549	120	942	1729	787
21	293	524	231	71	683	1238	555	121	947	1737	790
22	305	545	240	72	690	1250	560	122	952	1744	792
23	317	565	248	73	696	1262	566	123	957	1752	795
24	328	584	256	74	702	1274	572	124	961	1759	798
25	338	603	265	75	709	1286	577	125	966	1766	800
26	348	622	274	76	715	1297	582	126	970	1773	803
27	358	641	283	77	721	1309	588	127	974	1780	806
28	368	659	291	78	727	1320	593	128	978	1787	809
29	378	677	299	79	733	1332	599	129	983	1794	811
30	388	694	306	80	739	1343	604	130	988	1801	813
31	398	711	313	81	745	1355	610	131	992	1807	815
32	407	728	321	82	750	1366	616	132	996	1814	818
33	416	744	328	83	756	1377	621	133	1001	1821	820
34	425	760	335	84	762	1388	626	134	1005	1827	822
35	433	775	342	85	768	1399	631	135	1009	1833	824
36	442	790	348	86	773	1410	637	136	1014	1840	826
37	450	804	354	87	779	1421	642	137	1018	1846	828
38	458	818	360	88	785	1432	647	138	1023	1852	829
39	466	832	366	89	790	1443	653	139	1027	1858	831
40	475	847	372	90	796	1454	658	140	1031	1864	833
41	483	861	378	91	801	1464	663	141	1035	1869	834
42	491	875	384	92	807	1475	668	142	1039	1875	836
43	498	888	390	93	812	1485	673	143	1043	1881	838
44	506	902	396	94	818	1496	678	144	1047	1886	839
45	513	915	402	95	823	1506	683	145	1051	1892	841
46	520	928	408	96	829	1516	687	146	1055	1897	842
47	527	941	414	97	834	1526	692	147	1059	1902	843
48	534	954	420	98	840	1536	696	148	1063	1907	844
49	540	966	426	99	845	1546	701	149	1067	1912	845
50	547	979	432	100	851	1556	705	150	1071	1917	846

The International Seismological Summary for 1922 October, November, December.

FORMERLY THE BULLETIN OF THE
BRITISH ASSOCIATION SEISMOLOGY COMMITTEE.

The present number of the Summary completes its fifth year (1918, 1919, 1920, 1921, 1922). It seems appropriate now to scrutinize the information thus gathered in order to see what probable improvements to the adopted tables will be necessary in the future. The P and S residuals have therefore been collected, and at least two sensible modifications are indicated.

(1) There is a well-marked drop in the observed curves for both P and S, with its minimum at about $\Delta=38^\circ$, which the present tables have erroneously smoothed out. This drop has important consequences for the angle of emergence, and may solve a difficulty found by Galitzin.

(2) From $\Delta=80^\circ$ to $\Delta=110^\circ$ there is a separate phenomenon S_cP_cS generally recorded as S, but preceding it according to the formula

$$S - S_cP_cS = (\Delta - 80^\circ) \times 4.6s.$$

where Δ is measured in degrees. This phenomenon has been identified by Gutenberg as a ray which travels as S until it reaches the liquid core of the earth (of which the radius is about half that of the surface), then travels as a P ray through the core, and on emergence changes back into an S ray for the journey from core to surface. The designation S_cP_cS above used is that of Gutenberg. An excellent illustration of this ray is afforded by the earthquake of October 11d. 14h. in the present number, and a detailed note on that case will be found after the observations. But a fuller discussion is rendered possible by the collection of the S residuals, and will shortly be presented. This ray has something in common with [P] which travels as P throughout, but penetrates the core; and a convenient designation for it in this bulletin would therefore be [S], which would allow of ready tabulation of the residuals in the S column. But this method of presentation requires a little consideration before it is definitely adopted, and it is mentioned now in order to invite criticism of the proposal.

The present number of the Summary deals with 72 epicentres, 23 of which are new and 49 repetitions from old epicentres. We may perhaps repeat once more the corresponding figures from the beginning of the Summary in its international form :

New.						Old.					
	(1)	(2)	(3)	(4)	Yr.	(1)	(2)	(3)	(4)	Yr.	N/O
1918	36	44	43	35	158	44	38	67	53	202	0·78
1919	20	27	31	22	100	34	41	91	33	199	0·50
1920	24	27	31	27	109	47	48	49	42	186	0·59
1921	31	29	26	18	104	30	36	36	47	149	0·70
1922	32	38	31	23	124	36	51	58	49	194	0·64

The cases of assumed abnormal focal depth are :—

Date.	Epicentre.	Depth below normal.
Oct. 24d. 21h.	47°·3N. 151°·5E.	+·010
Nov. 3d. 12h.	7°·6S. 128°·3E.	+·040
Dec. 6d. 13h.	36°·8N. 69°·5E.	+·020

Reference has already been made to the note on October 11. Attention may further be called to a note of a different kind on the disastrous earthquake of Nov. 11d. 4h., in Chile, which was followed by several aftershocks, the smaller of which are still under investigation at the time of going to Press, and will be noted at the end of this number of the Summary.

The earthquake of December 6 may have been a double shock ; see note appended to it. There are also special notes to December 19d. 3h. and to December 31d. 7h.

It is perhaps worthy of record that the present MS. is being delivered to our printers by special messenger during the General Strike.

H. H. TURNER.

University Observatory, Oxford.
1926 May 12.

1922 OCTOBER, NOVEMBER, & DECEMBER.

Oct. 1d. 17h. 26m. 8s. Epicentre $3^{\circ}0'N$. $89^{\circ}0'E$.

$$A = +.017, B = +.998, C = +.052; \quad D = +1.000, E = -.017;$$

$$G = +.001, H = +.052, K = -.999.$$

Very doubtful.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Colombo	9.9	294	2 28	- 1	—	—	4.2	6.4
Kodaikanal	13.6	303	5 58	?S	(5 58)	0	—	—
Batavia	20.0	117	i 4 33	- 8	8 31	+ 8	—	—
Zi-ka-wei	41.6	44	—	—	—	—	e 21.4	—

Batavia gives also $i = +8m.35s$.

Oct. 1d. Readings also at 7h. (near Tokyo), 13h. and 15h. (near Tacubaya), 17h. (near Tokyo).

Oct. 2d. Readings at 9h. (Colombo and Apia), 10h. (Strasbourg and Vienna), 18h. (near Tokyo), 20h. (near Lick).

Oct. 3d. Readings at 1h. (Paris), 2h. (near Tacubaya), 3h. (Marseilles), 5h. (Nagasaki, Kobe, and near Osaka), 9h. (Zi-ka-wei and Taihoku), 12h. (Manila and Eskdalemuir), 13h. (Manila (2) and De Bilt), 14h. (near Osaka), 16h. (La Paz), 17h. (Batavia), 18h. (near Tacubaya), 20h. (La Paz and near Manila), 21h. (near Manila), 22h. (Eskdalemuir).

Oct. 4d. Readings at 1h. (De Bilt, Eskdalemuir, and Oxford), 2h. (Oxford), 4h. (near Manila and near La Paz), 5h. (near Merida and Tacubaya), 9h. (Colombo), 12h. (Mizusawa), 13h. (near La Paz), 14h. (Eskdalemuir and near Algiers), 15h. (Paris), 16h. (La Paz (2)), 17h. (Paris), 20h. (La Paz).

Oct. 5d. 5h. 13m. 36s. Epicentre $2^{\circ}1'N$. $127^{\circ}8'E$. (as on 1921 Dec. 7d.).

$$A = -.612, B = +.790, C = +.037; \quad D = +.790, E = +.613;$$

$$G = -.022, H = +.029, K = -.999.$$

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Manila	14.2	332	e 3 34	+ 5	—	—	6.5	7.0
Batavia	22.5	248	e 5 45	+34	—	—	—	—
Taihoku	23.7	346	—	—	—	—	e 9.4	—
Hong Kong	24.1	328	5 22	- 7	9 34	-12	11.6	—
Zi-ka-wei	29.7	349	i 6 19	- 6	e 11 18	-11	—	19.4
Osaka	33.3	11	7 20	+21	11 44	-45	14.8	19.6
Kobe	33.3	11	e 6 22	-37	—	—	e 7.4	10.0
Tokyo	35.3	16	e 7 54	+38	e 13 26	+26	—	15.2
Mizusawa	39.0	16	7 42	- 4	13 45	- 7	—	—
Sydney	42.1	150	8 12	0	17 12	?SR ₁	25.8	30.9
Melbourne	43.0	160	8 6	-12	i 14 24	-24	22.6	28.8
Honolulu	E. 74.5	69	—	—	—	—	e 34.4	—
Hamburg	104.3	327	—	—	i 24 49	-107	53.4	—
De Bilt	107.6	326	—	—	e 25 3	-123	e 54.4	56.5
Uccle	108.6	325	—	—	e 25 6	-129	e 53.4	—
Edinburgh	109.7	334	—	—	—	—	e 58.4	—
Eskdalemuir	110.1	333	—	—	e 25 12	-137	48.4	—
Oxford	111.1	329	—	—	i 28 41	+63	57.4	66.2
Bidston	111.1	330	—	—	—	—	46.4	—
Fordham	132.7	22	—	—	39 24?	?	—	—
La Paz	158.8	134	20 9 [+ 2]	—	26 51	?	—	—

Additional readings : Manila gives also $MN = +6.6m$. Batavia $i = +8m.31s$.
 and $+8m.55s$. Epicentre $1^{\circ}8'N$. $126^{\circ}4'E$. Osaka $MN = +16.6m$. Kobe
 $MN = +9.5m$. Tokyo $MN = +14.7m$. Melbourne $iSR_1 = +17m.36s$.
 De Bilt $MN = +56.3m$. Eskdalemuir $e = +28m.32s$.

Oct. 5d. Readings also at 11h. (Hong Kong and Manila), 12h. (La Paz), 16h. (Mizusawa, near Osaka (2), Kobe, and Tokyo (2)), 17h. (Hong Kong, Zi-ka-wei, and near Taihoku), 18h. (De Bilt), 19h. (Batavia), 23h. (near Porto Rico and Port au Prince).

Oct. 6d. 5h. 28m. 20s. Epicentre $62^{\circ}0'N$. $155^{\circ}0'W$.

$$A = -.426, B = -.198, C = +.883; \quad D = -.423, E = +.906; \\ G = -.800, H = -.373, K = -.470.$$

Rough. Some of the readings would be better suited with T_0 later (say 5h.29m.0s.), and an epicentre further N. and E. (say $65^{\circ}N$. $150^{\circ}W$.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Sitka	11.1	107	—	—	e 5 17	+20	6.5	6.8
Victoria	22.3	113	5 33	+24	—	—	1 7.8	—
Berkeley	31.4	127	e 6 7	-35	—	—	—	—
Chicago	43.7	87	9 50	+86	17 13	?SR ₁	23.2	—
Ann Arbor	45.2	82	—	—	e 15 16	- 2	—	—
Toronto	46.1	78	—	—	—	—	24.7	26.3
Ottawa	46.4	74	8 35	- 8	15 30	- 3	e 20.7	—
Ithaca	48.4	77	—	—	e 15 52	- 7	e 23.7	—
Northfield	48.8	72	—	—	—	—	e 22.2	—
Georgetown	50.9	80	e 22 40?	?	i 26 35	?L	(i 26.6)	—
Washington	50.9	80	i 10 7	+55	i 17 33	+63	—	—
Eskdalemuir	60.6	19	e 10 44	+28	i 18 30	- 1	29.7	—
Hamburg	63.9	10	e 10 40	+ 3	i 19 12	0	—	—
De Bilt	64.9	13	—	—	e 19 23	- 1	—	—
Uccle	66.0	14	e 11 16	+25	19 35	- 2	—	—
Vienna	69.6	7	e 11 11	- 4	i 20 23	+ 2	—	—
Toledo	75.6	23	11 26	-27	21 48	+15	—	—
Rocca di Papa	75.8	9	e 11 44	-10	22 10	+35	—	—
Granada	78.2	24	11 57	-11	21 37	-25	—	—
La Paz	103.1	101	18 9	?PR ₁	—	—	24.1	25.3

Additional readings: Sitka gives also eN = +4m.5s., LE = +7.4m. Ithaca
L = +24.9m. Vienna iPZ = +11m.43s. Rocca di Papa iPN =
+11m.46s.

Oct. 6d. Readings also at 0h. (Toronto), 8h. (near Tokyo), 9h. (Florence), 19h. (Eskdalemuir, De Bilt, and near Tokyo), 22h. (La Paz).

Oct. 7d. Readings at 0h. (Eskdalemuir, Zi-ka-wei (2), Tokyo, and La Paz), 1h. (De Bilt), 5h. (La Paz), 9h. (Merida), 11h. (Zi-ka-wei), 13h. (Nagasaki (2), Zi-ka-wei (2), and Hong Kong), 14h. (Eskdalemuir, De Bilt, and Strasbourg), 15h. (Denver), 16h. (Chicago, Ann Arbor, Toronto, Victoria, and Ottawa), 18h. (Zi-ka-wei), 19h. (Zi-ka-wei and near Berkeley), 20h. (Zi-ka-wei).

Oct. 8d. Readings at 1h. (Zi-ka-wei), 2h. (Granada (2), Rocca di Papa, and near Taihoku), 3h. (Hong Kong, Zi-ka-wei, and Granada), 16h. (Ootomari, Zi-ka-wei, and De Bilt), 17h. (Uccle, Batavia, Eskdalemuir, and near Osaka), 20h. and 21h. (near La Paz).

Oct. 9d. Readings at 5h. (near La Paz (2) and near Taihoku), 7h. (near Tokyo), 8h. (La Paz and near Batavia), 9h. (Eskdalemuir and Sydney), 19h. (near Tacubaya (2)), 20h. (near Mizusawa).

Oct. 10d. 22h. 5m. 48s. Epicentre $24^{\circ}0'N$. $121^{\circ}0'E$. (as on 1919 Aug. 28d.).

$$A = -.470, B = +.783, C = +.407; \quad D = +.857, E = +.515; \\ G = -.210, H = +.349, K = -.914.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.1	24	0 17	0	(0 28)	- 3	0.5	—
Hong Kong	6.5	257	1 40	+ 1	—	—	—	4.2
Zi-ka-wei	7.2	3	e 1 38	-11	—	—	—	—
De Bilt	85.6	326	—	—	—	—	e 47.2	54.8
Uccle	86.7	326	—	—	—	—	e 47.2	—
Edinburgh	87.2	332	—	—	—	—	—	56.2

De Bilt gives also MN = +55.9m.

Oct. 10d. Readings also at 0h. (Tiflis), 5h. (Marseilles and near Tacubaya (2)), 12h. (near Batavia), 13h. (La Paz), 20h. (Apia), 21h. (Helwan), 22h. (Melbourne).

Oct. 11d. 6h. 44m. 0s. Epicentre $41^{\circ}5'N. 9^{\circ}0'E.$

$A = +.740, B = +.117, C = +.663; D = +.156, E = -.988;$
 $G = +.654, H = +.104, K = -.749.$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	2.8	85	i 0 48	+ 4	1 24	+ 7	(1.4)	1.5
Florence	2.8	36	0 43	- 1	—	—	—	1.3
Moncalieri	3.6	346	—	—	—	—	e 2.4	—
Pompeii	4.2	98	1 50	?8	(1 50)	- 5	—	—
Padova	4.4	28	0 58	-10	2 22	+21	3.0	3.9
Zurich	5.9	358	e 1 32	+ 1	i 2 43	+ 2	—	3.2
Strasbourg	7.1	352	—	—	e 3 51	?L	e 5.0	—
Vienna	8.5	35	e 1 49	-20	i 3 8	-42	—	3.7
Athens	11.9	102	e 4 39	?S	(e 4 39)	-38	5.0	5.2

Additional readings: Moncalieri gives also $L = +5.2m.$ Padova $SR_1 = +2m.30s.$ Vienna $i = +2m.43s.$

1922. Oct. 11d. 14h. 49m. 45s. Epicentre $15^{\circ}3'S. 73^{\circ}0'W.$

$A = +.282, B = -.922, C = -.264; D = -.956, E = -.292;$
 $G = -.077, H = +.252, K = -.965.$

See note at end on the values of S near $\Delta = 90^{\circ}.$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
La Paz	4.8	105	i 1 15	+ 1	(2 11)	0	2.2	2.4
La Quiaca	E. 9.7	136	2 39	+13	(4 3)	-18	4.0	6.8
	N. 9.7	136	2 45	+19	(4 3)	-18	4.0	5.6
Pilar	N. 18.4	155	4 9	-13	(7 3)	-46	7.0	10.0
Chacareta	E. 23.3	148	1 3	-77	(8 3)	-88	8.0	8.2
	N. 23.3	148	4 9	-71	(8 3)	-88	8.0	8.6
Cipolletti	24.0	171	1 45	?	—	—	5.4	7.4
Balboa Heights	25.1	345	5 39	0	10 27	+22	14.2	—
Rio Janeiro	29.1	110	i 6 39	+20	11 15	- 4	14.2	17.7
Port au Prince	33.9	0	e 6 56	- 8	12 1	-38	18.7	21.8
Porto Rico	E. 34.3	12	7 2	- 5	12 28	-16	—	—
	N. 34.3	12	6 56	-11	12 21	-23	17.1	21.6
Merida	E. 39.8	336	7 52	- 1	14 23	+20	17.4	20.8
	N. 39.8	336	7 51	- 2	14 21	+18	17.4	20.8
Vera Cruz	41.3	326	7 27	-38	—	—	15.0	19.0
Tacubaya	E. 43.2	322	8 17	- 3	14 59	+ 8	19.4	26.7
	N. 43.2	322	8 20	0	14 56	+ 5	19.3	23.6
Georgetown	54.4	356	9 42	+ 7	17 26	+12	e 23.8	—
Washington	54.4	356	9 37	+ 2	17 15	+ 1	27.2	—
St. Louis	56.3	341	i 9 50	+ 2	i 17 39	+ 1	e 24.2	32.8
Ithaca	57.8	357	i 9 59	+ 1	18 3	+ 7	29.2	—
Ann Arbor	58.4	350	10 3	+ 2	18 9	+ 5	28.4	26.0
Chicago	58.6	348	10 4	+ 1	17 33	-33	26.3	36.2
Northfield	59.5	1	10 13	+ 4	18 25	+ 8	e 28.1	—
Ottawa	60.8	358	10 16	- 2	18 39	+ 6	e 29.8	—
Denver	62.6	334	9 15	-74	—	—	35.2	—
Lick	69.7	320	i 11 30	+15	i 20 33	+11	i 30.8	37.8
Berkeley	70.5	320	i 11 19	- 1	20 36	+ 4	—	—
Victoria	77.8	329	11 48	-18	(20 39)	-79	20.6	22.9
San Fernando	81.4	49	12 27	0	22 45	- 6	42.0	56.4
Coimbra	E. 81.6	45	12 19	- 9	22 32	-10	39.2	43.9
	N. 81.6	45	—	—	22 36	- 6	40.2	44.0
Rio Tinto	81.7	48	12 45	+16	—	—	—	14.8
Cape Town	83.3	124	12 23	-15	22 36	-24	—	42.8
Granada	83.6	49	i 12 31	- 9	i 22 55	- 9	37.5	43.4
Toledo	84.5	47	i 12 35	-10	i 22 55	-19	e 38.1	46.3
Tortosa	88.0	47	i 12 53	-12	i 23 17	-35	38.4	48.5
Algiers	88.4	51	12 56	-11	i 23 25	-31	38.2	43.2
Barcelona	89.4	47	e 12 27	-45	i 22 55	-72	e 38.9	49.4
Le Mans	90.6	40	e 15 15	?	23 15	-65	—	49.2
Bidston	90.8	35	12 27	-53	25 10	+48	—	50.2
Honolulu	E. 91.1	292	—	—	24 7	-18	42.8	45.2

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Oxford	91.2	37	i 13 13	-9	i 23 34	-52	30.2	49.3
Eskdalemuir	91.5	32	13 7	-17	23 38	-51	38.2	49.0
Kew	91.6	37	13 15	-10	—	—	—	53.2
Edinburgh	91.8	32	i 13 15	-11	i 23 48	-45	40.2	49.1
Paris	92.3	40	e 14 13	+44	e 23 42	-56	38.2	48.2
Marseilles	92.3	47	e 13 15	-14	23 57	-41	40.2	41.2
Dyce	92.9	30	13 22	-10	23 52	-52	39.0	52.5
Besançon	93.9	43	e 13 25	-12	23 51?	-64	47.2	—
Uccle	94.1	39	13 21	-18	23 53	-64	41.2	49.0
Moncalieri	94.4	45	13 12	-28	i 23 58	-62	35.8	57.4
De Bilt	95.0	38	13 27	-16	23 58	-68	e 45.2	49.7
Strasbourg	95.5	41	i 13 30	-16	e 24 6	-65	48.2	49.6
Zurich	95.7	44	i 13 30	-17	i 24 8	-65	—	—
Wellington	95.7	225	e 13 27	-20	i 23 57	-76	43.6	48.2
Florence	96.5	47	13 20	-32	24 5	-76	—	50.2
Rocca di Papa	97.0	49	i 13 35	-19	i 24 9	-77	e 47.4	52.8
Padova	97.4	45	13 38	-18	24 13	-77	—	54.8
Bergen	97.7	29	e 13 15	-43	—	—	53.0	—
Pompeii	98.1	50	13 30	-31	24 0	-97	49.2	59.2
Hamburg	98.2	37	e 13 40	-21	i 24 14	-84	48.2	53.2
Vienna	100.9	43	i 13 52	-23	i 24 28	-96	e 43.2	56.8
Belgrade	103.2	47	e 18 23	?PR ₁	i 24 38	-108	29.4	29.4
	103.2	47	18 37	?PR ₁	i 24 42	-104	29.5	—
Upsala	103.5	31	e 17 57	?PR ₁	i 24 37	-112	e 45.6	55.7
Konigsberg	104.4	37	—	—	e 24 45	-112	—	57.2
Athens	104.7	55	e 17 38	?	i 24 40	-119	—	—
Helwan	109.8	65	e 14 35	-21	25 4	-142	—	63.8
Sydney	115.3	218	19 33	?PR ₁	29 27	+75	52.8	59.0
Melbourne	116.1	212	—	—	—	—	—	63.2
Tiflis	120.8	50	e 21 5	?PR ₁	e 27 17	-98	52.2	66.2
Adelaide	121.5	209	—	—	—	—	e 45.6	61.2
Tokyo	144.4	310	e 20 43	[+56]	—	—	—	—
Nagoya	146.7	312	20 31	[+40]	—	—	—	—
Bombay	147.2	79	20 26	[+35]	—	—	—	—
Osaka	148.0	312	19 58	[+5]	—	—	20.6	21.8
Simla	148.5	53	19 57	[+3]	—	—	e 82.8	—
Batavia	158.5	180	20 29	[+23]	—	—	74.5	—
Zi-ka-wei	159.4	323	e 19 59	[-8]	e 28 15	?	—	96.2
Calcutta	160.9	65	20 38	[+29]	—	—	—	—
Taihoku	163.3	308	—	—	e 32 15	?	—	—
Manila	166.5	268	e 20 36	[+23]	e 31 30	?	50.7	—
Hong Kong	170.2	317	19 49	[-26]	30 5	?	46.2	—

Additional readings and notes: Balboa Heights gives also SN = +10m.35s. Porto Rico PR₁N = +8m.6s., SR₁E = +15m.1s., SR₁N = +15m.6s., LN = +19.2m., T₀ = 14h.49m.51s. Georgetown eLN = +23.2m., LE = +28.4m., LN = +28.8m. Ithaca PR₁ = +12m.33s., eE = +24m.41s. Anu Arbor MN = +34.2m., L = +34.4m., T₀ = 14h.49m.48s. Ottawa PR₁? = +12m.59s., SR₁? = 23m.30s., SR₂ = +25m.35s., T₀ = 14h.49m.40s. Denver readings have been increased by 3h. Lick iE = +20m.39s. Berkeley SN = +20m.37s. San Fernando MN = +49.8m. Coimbra iSE = +22m.38s., iSN = +22m.42s., iE = +23m.16s., iN = +23m.44s., eLN = +34.2m., eLE = +36.2m., T₀ = 14h.49m.49s. Toledo PR₁NE = +15m.53s., PR₁NW = +16m.30s., and +18m.24s., SR₁NE = +29m.20s., and +31m.53s., MNW = +51.2m. Barcelona PR₁ = +17m.5s., i = +23m.15s., +24m.30s., and +25m.55s., SR₁? = +29m.19s., MN = +43.0m., T₀ = 14h.49m.42s. Bidston P = +13m.15s. Honolulu SR₁E = +30m.55s., SR₁N = +30m.25s., eSR₂N = +36m.35s., MN = +36.9m., T₀ = 14h.50m.1s. Oxford PR₁ = +17m.12s. Eskdalemuir PR₁ = +16m.51s., PR₂ = +18m.51s., MN = +45.7m. Paris iS = +23m.48s., MN = +46.2m. Uccle PR₁ = +16m.41s., SR₁ = +31m.19s., MN = +51.9m. Moncalieri MN = +54.6m. De Bilt PR₁E = +16m.53s., MN = +51.5m., origin 16° 0S. 73° 0W., T₀ = 14h.50m.39s. Strasbourg P = +13m.33s. and +13m.37s., PR₁ = +17m.9s. MN = +50.9m., T₀ = 14h.50m.36s. Zurich eS = +14m.1s., origin 16° 0S. 73° 0W., T₀ = 14h.50m.29s. Wellington ePR₁ = +17m.21s., e = +21m.57s. i = +26m.15s., SR₁ = +31m.39s. Rocca di Papa PR₁ = +16m.36s., eSN = +24m.12s., eLN = +32.8m. and +42.4m. Bergen PR₁ = +23m.50s. Pompeii PR₁ = +17m.20s. Hamburg PR₁ = +17m.34s., SR₁ = +30m.45s., SR₂ = +36m.21s. Vienna iPR₁ = +18m.4s., PR₂ = +19m.22s., PS = +25m.36s., iE = +27m.19s., i = +28m.1s., SR₁? = +29m.37s., iN = +32m.37s. and +34m.45s. Belgrade PR₁N = +19m.47s., LE = +62.4m., MN = +63.5m. Upsala MN = +57.3m. Konigsberg PR₁? = +18m.34s., i = 24m.48s., PSN? = +26m.6s., MN = +53.2m. Athens ePR₁ = +20m.30s., iE = +25m.32s., SR₁ = +27m.48s. Helwan PR = +19m.0s. Adelaide gives many other readings. Tiflis e = +21m.25s. +26m.50s., +30m.24s., and +36m.42s., MN = +61.4m. Osaka MN = +22.5m. Batavia eLE = +50.2m., eL = +109.5m. Zi-ka-wei PR₁Z = +24m.48s., PSZ = +28m.52s. Calcutta PE = +20m.49s. Manila PR₁E = +25m.15s., PR₁N = +25m.46s.

NOTE TO 1922 OCT. 11d. 14h. 49m. 45s.

The readings for S from near $\Delta = 80^\circ$ to about $\Delta = 110^\circ$ probably refer to something preceding the true S. The residuals can be represented by the formula:—

$$-(\Delta - 80^\circ) \times 4.6s.$$

Δ	O.	C.	O-C.	Δ	O.	C.	O-C.
81.4	-6	-6	0	94.1	-64	-65	+1
81.6	-8	-7	-1	94.4	-62	-66	+4
83.3	-24	-15	-9	95.0	-68	-69	+1
83.6	-9	-17	+8	95.5	-65	-71	+6
84.5	-19	-21	+2	95.7	-65	-72	+7
88.0	-35	-37	+2	95.7	-76	-72	-4
88.4	-31	-39	+8	96.5	-76	-76	0
89.4	-72	-43	-29	97.0	-77	-78	+1
90.6	-65	-49	-16	97.4	-77	-80	+3
90.8	+48	-50	(+98)	98.1	-97	-83	-14
91.1	-18	-51	(+33)	98.2	-84	-84	0
91.2	-52	-52	0	100.9	-96	-96	0
91.5	-51	-53	+2	103.2	-106	-107	+1
91.8	-45	-54	+9	103.5	-112	-108	-4
92.3	-56	-57	+1	104.4	-112	-112	0
92.3	-41	-57	+16	104.7	-119	-114	-5
92.9	-52	-59	+7	109.8	-142	-137	-5
93.9	-64	-64	0	115.3	+75	-162	(+237)
				120.8	-98	-188	(+90)

These results had just been tabulated when a letter was received from Dr. Harold Jeffreys calling attention, in enthusiastic terms, to Prof. Gutenberg's paper *Erdbebenwellen VIIa*, in *Gott. Nach.* 1914, and it was at once seen that the readings tabulated as S refer to Gutenberg's ray ScPcS, that is a ray which travels as S until it reaches the liquid core of the earth, is then transformed into P, and finally emerges as S. Since the middle part of its path is described with the velocity of P, which is greater than that of S, it naturally arrives before S. The figures given by Gutenberg compare with the adopted tables for S as below:—

Δ	54	65	70	77	79.5	87.0	94.5	102
	s.	s.	s.	s.	s.	s.	s.	s.
ScPcS	1175	1260	1295	1341	1348	1395	1442	1480
S	1029	1165	1226	1309	1338	1421	1501	1575
ScPcS-S	+146	+95	+69	+32	+10	-26	-59	-95
Formula	+120	+69	+46	+14	+2	-32	-67	-101
Diff.	+26	+26	+23	+18	+8	+6	+8	+6

It will be seen that throughout the range $\Delta = 80^\circ$ to $\Delta = 110^\circ$ from which the formula $(80^\circ - \Delta) \times 4.6s$, was deduced, the difference between it and the value of ScPcS-S assigned by Gutenberg is constant at about +7s. It changes a little for values of Δ back to 54° , but this only means that the formula for the difference from S is only approximately linear: and it is rather remarkable that the approximation should be so close. In this region ScPcS follows S, and is not very likely to be recorded.

But the large negative residuals from S were noticed in 1917 in discussing the observations of 1913 (*The Large Earthquakes of 1913. B.A. Seism. Ctee.*, 1917). On p. vii the S-P residuals are divided into five sets as follows, the figures without signs representing the numbers of observations:—

SUMMARY OF APPARENT ALTERNATIVES FOR S-P.

	Δ 82.5	87.5	92.5	97.5	102.5	107.5	112.5	117.5	125.0	140.0
I	—	—	-2	-17	-10	+1	-3	-16	-22	-27
			10	3	6	7	6	2	4	2
II	-7	-15	-30	-59	-75	-100	-118?	—	-94	-100?
	126	83	40	43	32	6	1	0	14	8
III	?	?	-66	-100	-136	-180	—	-196	-203	-170?
			14	7	2	3	—	2	11	3
IV	?	-93	-166	—	-196	-276?	-295?	-277	-288	—
		7	1	—	4	1	1	2	9	—
V	—	—	-337?	-315	-340	-375?	—	—	-344	—
			1	1	5	7	—	—	8	—

The quantity S-P was dealt with rather than S alone in order to eliminate errors of time-determination, which were in 1913 more troublesome than in these days of wireless signals. But the errors of P are comparatively small and the large residuals are chiefly due to S.

Now it is easy to identify S_cP_cS with the Set II, which absorbs the greater part of the observations. We may regard Set I as the normal S, and the records at values of Δ exceeding 110° merit further examination; for it is very rare for S to be recorded in that region. Set II or S_cP_cC dies out after 110° , but there are a number of cases under $\Delta = 125^\circ$ and $\Delta = 140^\circ$ which merit attention. Sets III, IV, and V need not be considered at present. There would not be much difficulty in explaining them all as mistakes of whole minutes.

Prof. Gutenberg's explanation of Set II is thus very welcome, and it is much to be regretted that it has been so long overlooked. Copies of some recent papers have been kindly sent to Oxford, but not that of 1914, and in default of the explanation therein given his notation was not understood. Moreover, attention has been chiefly concentrated on tabulating sufficient records in order to obtain corrections to the adopted tables. We now have five years of the *International Summary* (1918-1922), in addition to five years (1913-1917) not so satisfactory, and the residuals are being collected for discussion, beginning with $\Delta 0^\circ - 90^\circ$. They show clearly the separation of S from S_cP_cS , and an early opportunity will be taken of exhibiting this distinction for the future.

Oct. 11d. Readings also at 5h. (La Paz), 9h. (Melbourne), 11h. (near Taihoku), 12h. (Hong Kong, Calcutta, Zi-ka-wei, Taihoku, and Batavia), 13h. (De Bilt), 15h. (Melbourne), 18h. (near Tacubaya), 20h. (near Tokyo), 21h. (near Tacubaya), 22h. (La Paz).

Oct. 12d. Readings at 1h. (near La Paz), 4h. (Dehra Dun), 12h. (Taihoku and Tortosa), 13h. (Zi-ka-wei), 15h. and 16h. (Taihoku), 17h. and 18h. (La Paz), 19h. (Colombo), 20h. (near Tacubaya), 22h. (Lemberg), 23h. (La Paz and Melbourne).

Oct. 13d. Readings at 6h. (Lick), 13h. (Zi-ka-wei), 16h. (Colombo), 18h. (Vera Cruz), 19h. (near Merida and Tacubaya), 23h. (near Kobe).

Oct. 14d. 0h. 14m. 50s. Epicentre $19^\circ 0'N$. $120^\circ 5'E$.

$$A = -\cdot 480, B = +\cdot 815, C = +\cdot 326; \quad D = +\cdot 862, E = +\cdot 507; \\ G = -\cdot 165, H = +\cdot 280, K = -\cdot 946.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	4.4	173	e 1 9	+ 1	(2 3)	+ 2	2.0	2.5
Hong Kong	6.7	301	1 41	- 1	—	—	3.9	4.6
Zi-ka-wei	12.2	4	e 2 56	- 6	—	—	—	—
Osaka	20.5	37	4 43	- 4	—	—	—	5.7
Colombo	41.3	260	—	—	—	—	—	10.2
De Bilt	E. 89.5	326	—	—	—	e 47.2	57.6	—
	N. 89.5	326	—	—	—	e 46.2	56.7	—
Strasbourg	89.9	323	—	—	—	e 57.2	—	—
Dyce	N. 90.1	333	—	—	—	i 50.3	56.2	—
Uccle	90.6	325	—	—	—	e 46.2	—	—
Eskdalemuir	91.8	332	—	—	e 23 41	-52	45.2	—
Kew	92.7	328	—	—	—	—	—	60.2
La Paz	171.4	74	20 8	[- 7]	—	—	—	—

Additional reading: Osaka MN = +6.4m.

1922. Oct. 14d. $\left\{ \begin{array}{l} \text{3h. 56m. 25s. (I)} \\ \text{7h. 39m. 5s. (II)} \\ \text{23h. 46m. 45s. (III)} \end{array} \right\}$ Epicentre $25^{\circ}\text{ON. } 121^{\circ}\text{5E.}$
(as on 1922 Sept. 18d.).

A = -·472, B = +·773, C = +·423; D = +·853, E = +·522;
G = -·221, H = +·360, K = -·906.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°		m. s.	s.	m. s.	s.	m.	m.
I	Taihoku	0·1	22	0 15	+13	—	—	0·5	—
II		0·1	22	0 0	-2	—	—	0·2	—
III		0·1	22	0 20	+18	—	—	0·5	—
I	Hokoto	2·6	231	—	—	1 1	-11	1·5	—
II		2·6	231	1 8	?S	(1 8)	-4	1·6	—
III		2·6	231	0 45	+4	—	—	1·2	1·9
I	Zi-ka-wei	6·2	359	e 1 37	+2	e 3 24	?L	(e 3·4)	4·3
II		6·2	359	e 1 35	0	e 3 17	?L	(e 3·3)	—
III		6·2	359	1 41	+6	e 3 16	?L	(e 3·3)	—
I	Hong Kong	7·1	249	1 49	+1	—	—	4·1	5·1
II		7·1	249	1 45	-3	4 5	+52	4·7	5·1
III		7·1	249	1 45	-3	—	—	3·4	4·8
I	Manila	10·4	183	e 2 35	-1	—	—	6·0	8·9
II		10·4	183	e 2 35	-1	—	—	—	—
III		10·4	183	e 2 55	+19	—	—	6·4	—
I	Nagasaki	10·7	42	2 40	0	—	—	—	—
III		10·7	42	2 40	0	(4 50)	+2	4·8	9·2
I	Kobe	15·3	48	—	—	—	—	—	12·0
III		15·3	48	3 56	+13	7 3	+24	10·2	10·8
I	Osaka	15·5	48	3 47	+1	(7 1)	+17	7·0	11·6
II		15·5	48	3 43	-3	—	—	7·0	10·2
III		15·5	48	3 45	-1	(7 1)	+17	7·0	11·2
III	Nagoya	16·8	49	3 59	-3	—	—	10·6	14·8
I	Tokyo	19·0	51	e 3 38	-51	e 7 20	-42	—	—
III		19·0	51	e 3 41	-48	7 11	-51	—	15·3
III	Mizusawa	E. 21·8	45	5 10	+7	9 4	+3	—	—
III		N. 21·8	45	5 5	+2	9 6	+5	—	—
III	Ootomari	27·5	33	5 40	-23	11 44	+54	16·0	17·8
I	Calcutta	E. 30·3	273	14 11	?L	—	—	19·0	—
I		N. 30·3	273	14 30	?L	—	—	19·2	—
III		E. 30·3	273	6 46	+15	12 10	+31	17·8	19·8
III		N. 30·3	273	6 17	-14	11 24	-15	17·0	19·7
III	Batavia	34·3	207	i 6 42	-25	—	—	—	—
III	Dehra Dun	38·5	288	8 15	?	—	—	—	—
III	Simla	E. 39·2	290	11 33	?	—	—	21·6	22·2
III		N. 39·2	290	e 13 27	?S	(e 13 27)	-27	21·4	—
III	Bombay	45·2	273	e 11 35	?PR ₁	—	—	—	—
III	Tiflis	64·0	307	e 11 44	+66	e 19 20	+7	e 35·2	41·5
III	Sydney	65·4	153	19 21	?S	(19 21)	-9	30·8	36·8
III	Melbourne	66·6	160	—	—	—	—	—	36·6
III	Upsala	75·1	330	11 54	+4	e 21 31	+4	e 39·8	48·5
III	Konigsberg	75·6	325	i 11 57	+4	21 41	+8	e 39·3	48·2
III	Helwan	77·9	297	12 7	+1	22 0	+1	—	50·5
III	Belgrade	79·9	315	—	—	—	—	e 44·8	—
III	Bergen	80·1	334	24 28	?S	(24 28)	+124	52·2	—
III	Vienna	80·8	320	12 23	-1	22 37	+4	e 40·2	48·6
I	Hamburg	81·8	327	—	—	—	—	e 44·6	—
III		81·8	327	e 12 28	-1	e 22 45	+1	e 43·2	52·2
I	De Bilt	85·0	327	—	—	—	—	e 43·6	49·6
II		85·0	327	—	—	—	—	e 43·9	—
III		85·0	327	12 41	-7	23 8	-11	e 41·2	49·9
I	Dyce	N. 85·1	334	—	—	—	—	—	44·6
III		85·1	334	e 16 0	?PR ₁	23 5	-15	33·2	49·2
I	Strasbourg	85·6	323	—	—	—	—	e 60·6	—
III		85·6	323	e 12 41	-10	e 23 33	+7	46·2	56·6
III	Zurich	85·8	321	e 12 56	+4	e 23 38	+10	—	—
I	Uccle	86·1	326	—	—	—	—	e 42·6	49·6
III		86·1	326	e 12 51	-3	e 23 15	-16	e 42·2	57·0
III	Florence	86·1	319	23 11	?S	(23 11)	-20	—	51·2
III	Rocca di Papa	86·3	315	i 12 56	-1	21 33	-120	e 42·2	56·4
I	Edinburgh	86·4	333	—	—	—	—	e 46·6	—
III		86·4	333	—	—	e 23 27	-7	e 43·2	55·9
III	Eskdalemuir	86·8	333	e 13 0	+2	e 23 15	-24	42·2	48·1
III	Besançon	87·4	323	e 12 27	-34	23 35	-10	49·2	—

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
III Moncalieri	87.6	320	13 6	+ 3	23 28	-20	34.7	56.7
III Kew	88.0	329	25 15	?	—	—	—	63.2
III Bidston	88.0	330	25 8	?	36 15	?L	(36.2)	39.2
III Paris	88.3	325	8 57	?	—	—	46.2	55.2
I Oxford	88.3	329	—	—	—	—	46.4	49.1
III	88.3	329	—	—	i 23 44	-11	46.6	54.8
III Marseilles	89.9	320	—	—	e 23 15	-58	43.2	60.2
III Barcelona	92.9	320	—	—	—	—	e 40.2	53.2
III Berkeley	93.3	45	—	—	—	—	e 55.2	—
III Tortosa	94.3	321	17 18	?PR ₁	23 52	-67	e 36.2	61.9
III Algiers	95.2	316	—	—	—	—	e 54.2	63.2
I Toledo	97.6	322	—	—	—	—	e 53.6	—
III	97.6	322	—	—	—	—	e 47.2	—
III Granada	99.1	319	—	—	—	—	55.0	58.0
III Coimbra	E. 99.8	325	12 27	?	25 27	-27	48.8	56.8
III	N. 99.8	325	—	—	24 16	-98	50.8	59.7
III San Fernando	101.1	320	50 39?	?L	—	—	(50.6)	60.8
III Ottawa	107.9	13	e 20 33	?PR ₁	e 25 15	-114	48.8	—
III Chicago	108.0	22	19 45	?PR ₁	28 40	+90	e 51.2	—
III Ann Arbor	108.8	20	—	—	—	—	e 51.2	—
III Ithaca	110.5	14	—	—	—	—	53.8	—
III Georgetown	113.8	15	—	—	—	—	e 61.6	—
III Washington	113.8	15	—	—	e 26 30	-90	e 63.2	—
III Cape Town	113.9	242	—	—	—	—	—	64.2
III Cipolletti	163.9	152	75 3	?L	—	—	106.4	108.6
III La Paz	167.7	49	20 19	[+ 5]	—	—	—	—
III Andalgala	172.6	113	71 9	?L	—	—	(71.2)	—

Additional readings and notes: Zi-ka-wei I gives also $MZ = +4.8m.$, $T_0 = 23h.46m.28s.$ Nagasaki III $MN = +11.8m.$ Kobe I $MN = +11.5m.$ Osaka I $MN = +10.9m.$, II $MN = +11.0m.$, III $MN = +10.8m.$ Nagoya III $MN = +11.6m.$ Ootomari III $MN = +23.2m.$ Tiflis III $e = +23m.38s.$, $MN = +40.5m.$ Reading given as for 13d. Upsala III $MN = +46.9m.$ Konigsberg III $SN = +21m.47s.$, $MN = +42.2m.$, $T_0 = 23h.46m.47s.$ Belgrade III $E(M) = +57.9m.$ Vienna III $eN = +25m.9s.$, $eE = +32m.32s.$, $e = +41m.47s.$, $eL = +43.6m.$, $eE = +44m.49s.$ De Bilt I $MN = +49.8m.$, $MZ = +55.7m.$, III $SR_1 = +29m.16s.$, $MZ = +55.7m.$, $T_0 = 23h.46m.57s.$ Strasbourg III $MN = +49.8m.$ Uccle III $SR_1 = +29m.9s.$, $MN = +50.7m.$ Rocca di Papa III $eP = +13m.33s.$ Eskdalemuir III $SR_1 = +29m.15s.$, $SR_2 = +33m.15s.$, $MN = +53.1m.$ Moncalieri III $MN = +56.4m.$ Paris III $MN = +57.2m.$ Coimbra III $eE = +20m.18s.$, $eN = +20m.35s.$ (?PR₁), $T_0 = 23h.45m.1s.$ San Fernando III $MN = +67.4m.$ Ottawa III $eE = +29m.27s.$, $eLE = +44.2m.$ Chicago III $L = +59.2m.$ Ann Arbor III $L = +66.8m.$ Ithaca III $e = +47m.15s.$, $L = +57.2m.$, $+62.2m.$, and $+70.2m.$ Georgetown III $eN = +46m.15s.$, $LE = +62.2m.$, $LN = +66.6m.$ Washington III $L = +70.2m.$

Oct. 14d. Readings also at 0h. (La Paz), 3h. (Taihoku), 5h. and 6h. (near Lick), 7h. (Belgrade), 9h. (Batavia), 12h. (near Rocca di Papa), 15h. (La Paz), 17h. (Mizusawa and near Port au Prince), 18h. (Colombo), 23h. (Ottawa, Chicago, and near Taihoku (3)).

Oct. 15d. Readings also at 0h. (Zi-ka-wei and near Taihoku), 1h. (Zi-ka-wei, La Paz, and near Taihoku (2)), 2h. (Cipolletti), 4h. (near Tacubaya and Victoria), 7h. (La Paz), 8h. (near Taihoku), 9h. (La Paz and near Taihoku), 12h. (Taihoku), 15h. (Nagoya), 18h. (Colombo), 22h. (La Paz).

1922. Oct. 16d. 16h. 1m. 25s. Epicentre 39°5N. 91°5E.

A = -020, B = +771, C = +636; D = +1000, E = +026;
G = -017, H = +636, K = -772.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Simla	E.	14.3	239	e 3 5	-25	—	—	7.0	—
	N.	14.3	239	e 3 17	-13	—	—	7.4	—
Calcutta	E.	17.2	190	4 16	+ 9	7 6	-16	10.4	—
	N.	17.2	190	4 11	+ 4	7 28	+ 6	10.6	—
Zi-ka-wei		25.6	100	e 5 47	+ 3	e 10 32	+18	—	17.1
Hong Kong		25.8	125	10 28	?S	(10 28)	+10	14.4	15.1
Bombay		26.1	223	2 30	?	—	—	—	—
Colombo		34.2	203	12 5	?S	(12 5)	-38	19.2	19.9
Tifis		35.1	289	e 7 0	-14	e 12 20	-37	16.5	18.6
Manila		35.9	128	e 7 24	+ 3	—	—	21.6	—
Ootomari		37.4	63	20 20	?	—	—	21.0	21.6
Batavia		47.8	161	e 8 52	- 1	—	—	26.7	—
Konigsberg		48.3	314	i 8 47	- 9	15 47	- 9	19.2	27.6
Upsala		48.9	321	8 55	- 4	15 57	- 8	—	29.8
Helwan		49.5	278	i 8 49	-15	15 55	-18	—	35.1
Belgrade	E.	51.2	302	e 8 58	-16	e 16 23	-11	e 28.5	35.1
	N.	51.2	302	e 9 10	- 4	e 17 16	+42	e 29.0	34.0
Vienna		52.6	308	i 9 20	- 4	16 47	- 4	28.0	34.6
Bergen		54.6	323	9 37	0	21 55	?SR ₁	29.3	—
Hamburg		54.6	316	i 9 36	- 1	—	—	—	29.6
Pompeii		56.8	299	e 9 28	-23	—	—	—	—
Rocca di Papa		57.6	301	i 9 53	- 3	17 53	- 1	e 25.6	40.1
Florence		57.7	305	9 35	-22	—	—	—	32.7
Zurich		57.8	308	9 57	- 1	—	—	e 23.8	—
De Bilt		57.8	315	—	—	e 17 55	- 1	e 30.6	31.6
Strasbourg		57.8	310	9 57	- 1	17 57	+ 1	28.6	34.9
Uccle		58.8	314	e 10 4	0	e 18 11	+ 2	28.6	36.8
Dyce	N.	59.4	323	10 29	+21	18 39	+23	—	33.6
Moncalieri		59.4	307	i 10 7	- 1	21 41	?SR ₁	31.6	36.7
Besancon		59.5	309	e 10 12	+ 3	—	—	31.6	—
Edinburgh		60.5	320	e 10 23	+ 7	—	—	—	41.2
Eskdalemuir		60.8	320	i 10 21	+ 3	18 37	+ 4	28.1	38.1
Paris		60.8	313	e 13 52	?PR ₁	e 22 20	?SR ₁	31.6	37.6
Kew		61.1	316	—	—	—	—	—	41.6
Oxford		61.5	316	10 24	+ 2	18 45	+ 3	29.9	39.2
Bidston		61.7	318	15 10	?PR ₁	27 5	?L	(27.1)	40.8
Barcelona		64.7	305	—	—	—	—	e 35.2	44.0
Tortosa		66.0	306	10 55	+ 4	19 33	- 4	26.7	39.5
Toledo		69.5	307	11 16	+ 2	20 28	+ 8	e 30.0	45.4
Granada		70.7	304	i 10 38	-43	—	—	—	—
Coimbra		72.0	310	—	—	e 21 18	+28	38.2	—
San Fernando	E.	72.8	305	—	—	—	—	—	48.8
Victoria		86.8	23	—	—	—	—	—	53.7
Ottawa		94.3	352	—	—	—	—	e 50.6	—
Ann Arbor		98.1	356	—	—	—	—	e 48.6	—
Chicago		98.7	0	—	—	—	—	55.4	—
Georgetown	N.	100.9	352	—	—	—	—	e 50.3	—
La Paz		150.9	317	20 0 [+ 3]	—	—	—	—	—

Additional readings: Zi-ka-wei gives also MN = +15.7m. Tifis e = +8m.6s.
and +14m.37s., MN = +22.6m. Batavia i = +10m.43s. Konigsberg
PE = +8m.53s., iE = +9m.53s., E = +11m.41s., SE = +16m.47s., MN =
+25.6m., MZ = +28.6m. Upsala PR₁ = +10m.53s., MN = +26.2m.
Helwan PR₁ = +10m.43s. Belgrade PR₁E = +11m.29s., PR₂E =
+12m.56s., PR₂N = +13m.47s., LE = +31.8m., L = +43.1m. Vienna
iPE = +9m.23s. (O - C = -1), iN = +9m.48s., iE = +10m.10s., PR₁ =
+11m.23s., iE = +17m.14s., SR₁ = +21m.4s., e = +24m.8s., i = +28m.37s.
Hamburg e = +21m.35s. and +28m.35s. Rocca di Papa PR₁N =
+12m.11s., SE = +17m.47s. Strasbourg PR₁ = +12m.10s., PR₂ =
+13m.21s., SR₁ = +21m.52s., MN = +31.4m. Uccle SR₁ = +22m.28s.,
MN = +32.6m. Moncalieri i = +10m.7s., MN = +37.2m. Eskdalemuir
PR₂ = +13m.53s. Paris MN = +32.6m. Oxford PR₁ = +14m.3s.
Barcelona e = +24m.13s. Toledo MNW = +44.2m. Granada LM =
+10m.46s. Coimbra ePE? = +4m.55s., ePN? = +5m.55s., eS? =
+13m.52s., LN = +39.4m. San Fernando MN = +47.2m. Ottawa
e?E = +43m.5s., L = +55.6m. Ann Arbor L = +56.6m. Chicago e =
+44m.35s. Georgetown eN? = +41m.35s., eE = +46m.35s.

Oct. 16d. Readings also at 0h. (Bidston), 2h. (De Bilt, Hamburg, and Bergen), 3h. (Bergen, Uccle, and Eskdalemuir), 4h. (Uccle, Eskdalemuir, Oxford, Hamburg, and De Bilt), 6h. (Algiers), 10h. (near Mostar), 15h. (near Tacubaya), 16h. (Batavia and Granada), 20h. (Colombo).

Oct. 17d. 6h. 37m. 54s. Epicentre $12^{\circ}0'N$. $95^{\circ}0'E$. (as on 1918 Dec. 16d.).

A = -0.85, B = +.974, C = +.208; D = +.996, E = +.087;

G = -.018, H = +.207, K = -.978.

The La Paz [P] suggests a high focus, say -0.30 , and if the epicentre be moved to $18^{\circ}0'N$. $97^{\circ}0'E$., as on 1919 Sept. 8, this would suit all the observations except those of Hong Kong and Batavia. If by chance the latter were 1 min. in error, the hypothesis might be defended.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Calcutta	N.	12.3	330	3 5	+ 2	7 25	?L	11.0	15.0
Colombo		15.8	252	—	—	—	—	—	11.1
Kodaikanal		17.3	266	9 30	?S	(9 30)	+125	11.6	14.0
Hong Kong		21.0	58	4 43	-10	8 46	+ 2	11.0	14.1
Batavia		21.6	150	4 54	- 6	—	—	i 12.0	—
Simla	N.	25.2	322	e 5 48	+ 8	—	—	—	—
Manila		25.5	83	e 5 28	-15	—	—	i 13.7	17.4
Taihoku		28.2	62	e 5 9	-61	—	—	—	—
Zi-ka-wei		31.0	48	—	—	e 11 33	-18	(e 15.8)	20.2
Nagasaki		38.0	52	21 5	?L	—	—	(21.1)	—
Kobe	E.	42.8	51	—	—	—	—	—	28.5
Osaka		43.1	51	7 0	-79	—	—	—	30.7
Tokyo		46.7	50	—	—	—	—	e 24.9	—
Melbourne		68.3	139	—	—	—	—	e 25.4	43.4
Konigsberg		71.2	325	—	—	e 20 37	- 3	—	47.1
Upsala		73.3	330	11 40	+ 2	21 0	- 6	e 40.9	46.9
Vienna		73.5	316	e 11 41	+ 2	e 21 46	+38	e 40.1	49.4
Rocca di Papa		76.3	312	e 12 54	+57	25 24	?	e 36.4	56.3
Florence		77.2	315	—	—	—	—	—	49.1
Hamburg		77.4	323	e 12 2	- 1	e 21 56	+ 3	e 47.1	53.5
Strasbourg		79.2	319	—	—	—	—	e 46.1	—
De Bilt		80.5	320	12 24	+ 2	e 22 29	0	e 42.1	55.0
Dyce	N.	83.7	328	23 25	?S	(23 25)	+19	46.3	52.9
Kew		83.8	321	50 6	?L	—	—	(50.1)	59.1
Oxford		84.4	321	—	—	22 54	-18	46.9	56.6
Edinburgh		84.6	326	—	—	e 33 6	?	48.1	56.1
Bidston		85.1	322	—	—	—	—	—	58.1
Granada		89.4	309	13 3	- 9	—	—	—	—
Coimbra		92.2	313	e 18 6	?PR ₁	e 28 6	?SR ₁	e 50.1	—
Victoria		110.7	27	—	—	—	—	60.6	67.1
Ottawa		122.0	351	—	—	—	—	e 59.1	—
Toronto		124.1	355	—	—	—	—	78.7	—
Ann Arbor		125.7	357	—	—	—	—	e 62.1	—
La Paz		163.1	253	20 29	[+19]	—	—	—	—

Additional readings and notes: Batavia gives also $i = +13m.34s.$ and $+16m.52s.$ Manila MN = $+17.1m.$ Zi-ka-wei MN = $+20.4m.$ Nagasaki L = $+23.3m.$ Kobe MN = $+26.6m.$ Osaka MN = $+27.2m.$ Konigsberg iE = $+20m.46s.$ MN = $+42.1m.$ Upsala MN = $+44.0m.$ Vienna iPZ = $+11m.43s.$ Hamburg MN = $+51.6m.$ De Bilt MN = $+49.6m.$ Dyce S = $+34m.30s.$ All readings have been diminished by 1h. Eskdalemuir ($\Delta = 84^{\circ}7$, Az. = 323°), gives simply 7h. Coimbra e = $+34m.6s.$, LN = $+56.1m.$ and $+65.1m.$ Ottawa e? = $+54m.6s.$, LE = $+72.6m.$

Oct. 17d. 9h. 56m. 0s. Epicentre $12^{\circ}0'N$. $95^{\circ}0'E$. (as at 6h.).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Calcutta		12.3	330	3 16	+13	—	—	—	—
Colombo		15.8	252	—	—	—	—	7.5	10.5
Kodaikanal		17.3	266	6 18	+129	—	—	—	—
Hong Kong		21.0	58	—	—	—	—	—	13.0
Batavia		21.6	150	e 4 50	-10	—	—	i 10.4	—
Manila		25.5	83	e 6 0	+17	—	—	14.4	15.9
Zi-ka-wei		31.0	48	—	—	e 12 50	+59	—	19.4
Melbourne		68.3	139	—	—	—	—	e 31.4	43.3

Additional readings: Batavia gives also iE = $+6m.35s.$, i = $+13m.16s.$ Zi-ka-wei MN = $+22.1m.$

Oct. 17d. Readings also at 3h. (near Taihoku), 5h. (near Lick), 6h. (Malaga), 8h. (near Hong Kong), 11h. (near Tacubaya), 12h. (near Port au Prince and near Oaxaca), 16h. (Dehra Dun, Port au Prince, and near Algiers), 17h. (Colombo, Manila, Hong Kong, Calcutta, Malaga, Almeria, and near Granada), 18h. (Zi-ka-wei, and Batavia), 21h. (Batavia, Manila, and Calcutta).

Oct. 18d. Readings at 2h. (near Tortosa and near La Paz), 3h. (near Taihoku), 6h. (near La Paz), 13h. (Manila), 22h. (Manila), 23h. (near Tiflis).

Oct. 19d. Readings at 0h. and 1h. (Tiflis), 3h. (near La Paz), 4h. (Tiflis), 14h. (Eskdalemuir, Hamburg, Tiflis, and near Batavia).

Oct. 20d. 20h. 22m. 48s. Epicentre $37^{\circ}0'N$. $10^{\circ}0'W$.

$$A = +.787, B = -.139, C = +.602; \quad D = -.174, E = -.985; \\ G = +.593, H = -.105, K = -.799.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
San Fernando	3.1	100	0 51	- 2	1 24	- 2	—	3.0
Coimbra	3.5	21	1 2	+ 7	1 37	0	1.8	1.8
Malaga	4.5	92	1 59	?S	(1 59)	- 5	—	—
Granada	5.1	86	i 1 21	+ 2	i 2 24	+ 4	i 2.5	3.0
Toledo	5.5	57	1 26	+ 1	2 35	+ 4	e 3.0	3.5
Almeria	6.1	89	1 33	0	—	—	—	—
Alicante	7.6	77	1 37	-18	—	—	—	—
Tortosa	9.0	62	3 19	?S	(3 19)	-44	4.1	4.3
Barcelona	10.4	61	e 5 2	?	6 12	?L	(6.2)	—
Moncalieri	15.6	53	—	—	—	—	e 8.4	—
Uccle	17.2	32	e 4 6	- 1	e 7 36	+14	e 8.7	—
Rocca di Papa	18.1	68	i 4 17	- 1	—	—	e 11.9	—
De Bilt	18.5	30	—	—	8 5	+14	e 9.4	11.3
Pompeii	19.4	71	e 9 22	?L	—	—	(e 9.4)	—
Vienna	z.	22.3	5 1	- 8	—	—	—	—

Additional readings and notes: San Fernando gives also $MN = -3.7m$.
 Granada $MN = +2.7m$. Toledo $MN = +4.0m$, $MZ = +3.7m$. Barce-
 lona $i = +6m.7s$. De Bilt $MN = +10.9m$, $MZ = +12.9m$. Vienna
 reading is given as at 21h.

Oct. 20d. Readings also at 1h. (Tiflis (2) and near Manila), 4h. (La Paz), 7h. (near Mizusawa and Tokyo), 8h. (Mizusawa, Tokyo, and La Paz), 9h. (La Paz), 13h. (near Manila), 22h. (Florence).

Oct. 21d. Readings at 0h. (near Barcelona and Tortosa), 8h. (Lick), 14h. and 15h. (near Tiflis), 18h. (Moncalieri), 20h. (Manila and Strasbourg), 22h. (Manila and La Paz).

Oct. 22d. Readings at 1h. (Moncalieri), 6h. (La Paz, Tortosa, Almeria, Toledo, and near Granada), 8h. (Colombo, Zi-ka-wei, and Tiflis), 17h. (Manila and near Nagasaki).

Oct. 23d. Readings at 1h. (Batavia), 2h. (La Paz), 3h. (near Manila), 6h. (Ootomari, Tokyo, and near Mizusawa), 17h. (Zi-ka-wei and near Tacubaya (4)), 18h. (Hong Kong and De Bilt), 20h. (near La Paz), 22h. (Tortosa).

1922. Oct. 24d. 21h. 21m. 0s. Epicentre 47°3N. 151°5E.

(as on 1922 May 6d.).

A = -·596, B = +·324, C = +·735; D = +·477, E = +·879;

G = -·646, H = +·351, K = -·678.

A depth of focus 0·010 is assumed (see Note at end).

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Ootomari		0·0	267	1 40	+ 8	-	-	3·0	3·8
Mizusawa	E.	-0·1	226	2 43	- 1	4 37	-17	-	-
Tokyo		-0·2	221	3 20	-10	5 15	0	e 9·2	-
Nagoya		-0·3	227	3 42	-10	(6 54)	- 1	6·9	7·0
Osaka		-0·3	230	4 11	+ 5	(7 29)	+ 9	7·5	9·8
Kobe		-0·3	230	4 6	- 3	(7 23)	- 2	7·4	7·8
Nagasaki		-0·4	236	5 1	+ 2	(8 59)	+ 4	9·0	9·2
Zi-ka-wei		-0·6	246	i 5 58	- 4	e 10 36	-12	-	16·2
Taihoku		-0·7	237	6 20	-25	12 14	+ 9	16·7	-
Hong Kong		-0·8	242	7 26	-13	(13 17)	-22	13·3	22·0
Manila		-0·8	229	e 7 43	-17	-	-	-	-
Sitka	E.	-0·9	50	8 5	-11	14 34	-10	20·9	23·9
Honolulu	N.	-1·0	104	i 8 37	-10	i 15 30	-11	22·0	22·1
Victoria		-1·1	55	(9 41)	+15	-	-	9·7	30·8
Calcutta	E.	-1·1	269	9 40	+ 4	17 40	+25	26·3	-
	N.	-1·1	269	9 50	+14	17 28	+13	-	-
Simla	E.	-1·2	282	9 30	-18	19 42	+124	e 32·6	-
	N.	-1·2	282	9 48	0	17 36	- 2	e 34·9	-
Berkeley	E.N.	-1·2	65	e 10 13	+ 3	18 25	+ 6	e 29·4	35·9
Lick	N.	-1·2	65	e 10 14	- 2	i 18 35	+ 5	i 28·5	34·2
Batavia		-1·2	230	i 10 48	+ 2	i 19 28	+ 1	e 33·0	-
Upsala		-1·2	337	i 10 51	+ 4	-	-	e 32·3	40·2
Bombay		-1·3	276	12 5	+66	21 9	+74	36·7	42·9
Bergen		-1·3	345	i 11 11	+10	(20 10)	+14	20·2	-
Konigsberg	E.	-1·3	332	11 13	+ 5	20 15	+ 7	-	43·0
	N.	-1·3	332	11 11	+ 3	20 10	+ 2	-	-
Tiflis		-1·3	310	e 12 13	+65	i 22 15	+66	37·0	44·2
Kodaikanal		-1·3	268	12 36	+77	(21 18)	+47	21·3	21·6
Colombo		-1·3	263	11 30	+ 6	(21 12)	+32	21·2	22·5
Dyce	N.	-1·3	347	11 33	+ 4	20 56	+ 7	-	36·5
Hamburg		-1·3	338	i 11 37	+ 3	i 21 3	+ 5	e 37·0	43·0
Edinburgh		-1·3	347	e 11 44	+ 6	i 21 9	+ 2	36·0	47·8
Eskdalemuir		-1·3	347	i 11 45	+ 4	21 16	+ 3	36·5	-
De Bilt		-1·3	340	i 11 54	+ 4	i 21 34	+ 6	e 36·0	44·2
Chicago		-1·3	41	i 13 27	+96	i 22 39	+69	36·8	-
Vienna		-1·3	332	i 11 55	+ 3	21 34	+ 2	e 35·5	51·0
Bidston		-1·3	345	12 58	+65	22 35	+61	-	23·3
West Bromwich		-1·3	345	21 40	? S	(21 40)	- 1	-	-
Uccle		-1·3	340	i 12 1	+ 2	21 47	+ 3	36·0	44·6
St. Louis		-1·3	46	i 12 30	+31	i 21 48	+ 3	e 36·4	-
Ann Arbor		-1·3	38	12 24	+24	21 42	- 6	47·2	-
Oxford		-1·3	345	i 12 2	+ 1	i 21 49	0	-	-
Kew		-1·3	345	22 0	? S	(22 0)	+11	-	50·0
Belgrade		-1·3	327	i 12 5	+ 3	i 21 49	- 1	e 40·5	55·2
Ottawa		-1·3	31	12 26	+24	21 49	- 2	40·0	-
Toronto		-1·3	35	13 18	+75	22 36	+44	e 41·8	59·8
Strasbourg		-1·3	337	i 12 7	+ 1	i 22 3	+ 5	38·0	47·0
Innsbruck		-1·3	335	i 12 8	+ 2	e 22 2	+ 3	e 38·0	-
Zurich		-1·3	336	i 12 12	+ 1	i 22 9	+ 1	-	-
Paris		-1·3	341	i 12 14	+ 2	i 22 12	+ 1	43·0	46·0
Mostar		-1·3	327	i 12 17	+ 3	e 21 8	-66	e 41·0	-
Northfield		-1·3	30	12 45	+30	22 20	+ 5	e 38·0	-
Besancon		-1·3	338	e 12 25	+ 9	22 21	+ 3	29·0	-
Ithaca		-1·3	34	e 12 30	+14	22 10	- 8	35·0	-
Sydney		-1·3	180	13 30	+72	22 24	+ 3	31·2	38·2
Le Mans		-1·3	342	-	-	24 0	+95	-	48·0
Moncalieri		-1·3	336	12 22	- 4	22 30	- 9	37·4	50·0
Florence		-1·3	333	12 19	- 7	22 23	-16	-	41·5
Fordham		-1·4	34	e 12 28	+ 1	e 22 36	- 3	35·0	-
Athens		-1·4	321	12 26	- 2	i 22 36	- 5	e 45·0	47·4
Puy de Dôme		-1·4	340	12 30	+ 2	22 40	- 1	47·0	-
Adelaide		-1·4	191	e 11 0	-89	(e 22 30)	-13	i 22·5	22·8
Georgetown	E.	-1·4	37	e 12 38	- 7	i 22 44	- 3	e 37·8	-
	N.	-1·4	37	e 12 36	+ 5	22 44	- 3	48·4	-

Continued on next page.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	°	m. s.	s.	m. s.	s.	m.	m.
Washington	-1.4	83.5	37	13 43	+72	23 47	+60	40.3	—
Rocca di Papa	-1.4	83.8	330	i 12 31	-1	e 22 42	-8	34.3	58.9
Pompeii	-1.4	84.0	329	12 15	-19	22 35	-18	32.0	46.0
Marseilles	-1.4	84.6	337	e 12 45	+8	23 0	+1	42.0	54.0
Melbourne	-1.4	85.3	185	13 6	+25	i 23 6	-2	39.0	41.4
Perth	-1.4	85.5	210	13 6	+23	(23 8)	-1	23.1	—
Helwan	-1.4	86.0	312	i 12 42	-4	22 58	-17	—	57.1
Barcelona	-1.4	87.2	338	12 50	-2	i 23 24	-4	41.7	50.8
Tacubaya	-1.4	88.1	64	12 6	-51	22 11	-87	—	—
Tortosa	-1.4	88.2	339	12 49	-9	23 13	-26	40.0	51.2
Toledo	-1.4	90.2	343	12 59	-10	23 25	-36	e 38.2	56.7
Coimbra	E. -1.4	90.8	346	12 55	-17	23 26	-41	e 39.3	53.5
	N. -1.4	90.8	346	—	—	—	—	44.0	55.7
Wellington	-1.4	91.0	164	e 13 42	+28	23 18	-52	42.0	44.0
Algiers	-1.4	91.3	335	13 6	-9	23 21	-52	37.0	57.5
Granada	-1.4	92.6	341	i 13 20	-2	24 16	-10	33.0	38.8
Rio Tinto	-1.4	92.7	344	25 0	? S	(25 0)	+33	—	58.0
San Fernando	-1.4	93.9	343	13 12	-18	23 48	-52	46.0	58.2
La Paz	—	135.2	60	i 19 28	[-2]	33 6	?	65.0	67.2
La Quiaca	E. —	140.9	63	22 48	? PR ₁	—	—	28.9	30.2
Cape Town	—	142.5	274	19 30	[-14]	—	—	70.0	89.5
Andalgala	N. —	144.6	70	20 30	[+42]	—	—	—	70.2
Pilar	E. —	149.0	73	20 54	[+60]	—	—	78.3	86.0
	N. —	149.0	73	21 0	[+66]	—	—	81.3	84.4
Cipolletti	—	150.3	88	22 42	? PR ₁	—	—	45.5	46.3

Additional readings and notes: Ootomari gives also MN = -3.4m. Mizusawa SN = +4m.38s. Nagoya MN = -7.4m. Osaka MN = +7.5m. Kobe MN = +7.7m. Nagasaki MN = -9.4m. Readings all given as at 19h. Zi-ka-wei MN = +17.2m., T₀ = 21h.21m.3s. Sitka SR₁N = +17m.59s., MN = +18.6m., T₀ = 21h.20m.54s. Honolulu iPR₁N = +10m.29s., T₀ = 21h.20m.56s. Berkeley iPZ = +10m.12s. Lick ePZ = +10m.12s., ePE = +10m.20s., iZ = +10m.39s. Batavia i = +13m.48s. and +40m.24s. Upsala iN = -21m.25s., MN = +41.2m. Bergen S = +15m.29s. (iPR₁). Tiflis e = +13m.16s. and +18m.10s., eN = +31m.50s., MN = +65.7m. All readings given as on 25d. Konigsberg PZ = +11m.12s., PR₂ = +16m.10s., PS = +20m.58s., SR₁ = +29m.20s. Colombo S = +17m.42s. Hamburg PS = +21m.48s., SR₁ = +26m.48s., SR₂ = +30m.48s., T₀ = 21h.21m.10s. Edinburgh i = -21m.56s., SR₁ = +26m.44s. Eskdalemuir PR₁ = -15m.10s. De Bilt MN = +43.0m., MZ = +53.8m. Chicago PR₁ = -16m.30s., PR₂ = -18m.30s., SR₁ = +27m.47s. Vienna iN = +12m.26s., PR₁ = +15m.24s., iE = +19m.4s., iN = +21m.0s., i = +22m.6s., PS = +22m.24s., iE = +25m.56s., SR₁N = +26m.57s., iN = +27m.38s. Bidston readings are given as at 20h. Uccle SR₁ = +27m.48s., MN = +45.1m. Oxford PR₁ = +15m.37s. Belgrade PR₁ = +12m.10s., PR₂ = +13m.22s., SR₁E = +22m.1s., SR₁N = +22m.15s., SR₂E = +22m.33s., SR₂N = +22m.38s. Ottawa PR₁ = +15m.36s., T₀ = 21h.22m.3s. Toronto e = +27m.24s., L = +34.4m. Strasbourg iP = +12m.8s. and +12m.9s., MN = +54.8m., T₀ = 21h.21m.9s. Innsbruck PS = +23m.0s. Paris +23m.0s., MN = +45m.0s. Ithaca PR₁ = +15m.43s., L = -46.0m. and -53.0m. Moncalieri MN = +52.2m. Fordham eE = +22m.8s. Athens PR₁ = +15m.58s., iSE = +22m.41s., iN = +23m.24s. and +25m.36s., iE = +25m.41s., MN = +51.9m. Adelaide e = +21m.0s. Rocca di Papa iSN = +22m.46s. Melbourne SR₁ = +28m.36s., SR₂ = +32m.13s. Perth SR₁ = +20m.26s. Barcelona PR₁? = +17m.0s., PS = +24m.4s., MN = +51.5m. Coimbra iE = +23m.51s., and +24m.39s., T₀ = 21h.21m.21s. Origin at 52°5N. 159°0W. Wellington ePR₁ = +16m.42s., e = +21m.0s., SR₁ = +29m.30s. Granada PR₁ = +23m.38s., PS = +24m.42s., T₀ = 21h.21m.20s. San Fernando MN = +65.5m. La Paz PR₁ = +22m.33s., i = +23m.32s., T₀ = 21h.22m.25s.

Note on the assumption of focal depth +.010: There are four good groups of stations in mean azimuths 61°, 230°, 263°, and 341°. Without the assumption the mean errors in Δ would be all negative, viz., -1°.4, -0°.7, -0°.8, -0°.9 respectively. With the assumption these become -0°.3, -0°.2, +0°.3, +0°.4. They suggest a slight displacement of the epicentre, say to 47°.0N. 151°.8E.

Oct. 24d. Readings also at 3h. (La Paz), 8h. (La Paz and Zi-ka-wei), 11h. (Innsbruck, La Paz, Port au Prince, and near Balboa Heights), 19h. (Moncalieri), 22h. (Manila).

Oct. 25d. Readings at 0h. (near Balboa Heights), 3h. and 4h. (Moncalieri), 9h. and 17h. (La Paz), 22h. (Denver).

Oct. 26d. Readings at 14h. (near Oaxaca, Tacubaya, and Vera Cruz), 16h. (near La Paz), 17h. (Fordham).

Oct. 27d. 14h. 22m. 40s. Epicentre 23° -3N. 122° -0E. (as on 1922 July 2d.).

A = -487, B = +779, C = +396; D = +848, E = +530;
G = -209, H = +335, K = -918.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.8	345	0 39	+11	—	—	0.9	1.1
Hokoto	2.3	276	—	—	1 3	0	1.5	2.3
Hong Kong	7.3	264	1 50	-1	—	—	3.7	6.8
Zi-ka-wei	7.9	356	1 1 52	-8	e 3 39	+ 5	—	5.2
Manila	8.8	186	e 2 20	+ 7	—	—	i 5.2	6.4
Kobe	16.1	42	e 4 34	+41	—	—	e 11.4	16.9
Osaka	16.3	43	4 16	+20	(7 29)	+27	7.5	9.9
Tokyo	19.7	47	e 5 8	+31	e 8 59	?L	(e 9.0)	15.6
Calcutta	E. 31.0	275	7 15	+37	12 15	+24	18.5	—
Batavia	33.0	210	6 45	-11	i 12 9	-15	23.3	—
Simla	N. 40.4	291	—	—	—	—	e 21.0	—
Colombo	43.7	256	9 56	+92	(14 8)	-50	14.1	34.8
Kodaikanal	44.4	261	27 50	?L	—	—	(27.8)	—
Sydney	63.5	153	27 44	?	—	—	37.8	38.8
Melbourne	64.8	160	—	—	19 32	+ 9	29.4	45.6
Tiflis	65.5	308	—	—	—	—	e 40.3	43.2
Honolulu	72.9	74	—	—	e 21 20	+19	e 34.3	—
Konigsberg	77.4	325	i 12 12	+ 9	—	—	e 41.3	48.3
Bergen	82.0	335	37 35	?	47 35	?	52.1	—
Vienna	82.5	321	e 12 20	-13	e 22 56	+ 4	e 46.3	55.3
Hamburg	83.5	326	e 12 41	+ 2	—	—	e 42.3	54.4
Innsbruck	86.0	321	e 12 50	- 3	—	—	e 46.3	—
De Bilt	86.7	326	12 43	-14	23 11	-27	e 40.3	55.2
Strasbourg	87.4	322	e 12 50	-11	e 23 9	-36	48.3	57.4
Victoria	87.7	37	—	—	—	—	49.3	57.2
Uccle	87.8	325	e 12 56	- 8	e 23 20	-30	e 40.3	55.3
Edinburgh	88.3	331	—	—	e 23 20	-35	48.3	56.8
Eskdalemuir	88.6	331	e 14 20	?	e 23 20	-39	43.3	49.3
Moncalieri	89.3	320	e 12 19	-53	24 9	+ 3	47.1	62.0
Kew	89.8	329	—	—	—	—	—	59.3
Bidston	89.8	331	—	—	42 45?	?L	(42.8?)	59.8
Paris	90.0	324	—	—	—	—	e 48.3	57.3
Oxford	90.1	329	—	—	—	—	30.3	57.3
Barcelona	94.7	319	—	—	—	—	e 53.1	61.1
Tortosa	N. 95.9	320	—	—	—	—	e 47.3	62.3
Alziers	96.8	315	—	—	—	—	e 61.3	64.8
Toledo	99.2	321	—	—	—	—	e 52.3	64.3
Coimbra	101.4	324	—	—	—	—	e 53.3	—
Rio Tinto	102.2	321	58 20	?L	—	—	(58.3)	69.3
San Fernando	102.8	320	21 20	?PR ₁	—	—	—	69.0
Ottawa	109.4	12	—	—	—	—	e 52.3	—
Toronto	110.2	15	—	—	—	—	e 69.5	76.1
Ann Arbor	110.2	19	—	—	—	—	e 57.3	—
Ithaca	112.0	14	—	—	—	—	68.3	—
Cape Town	113.5	242	—	—	—	—	—	70.8
La Paz	168.3	57	19 57	[-17]	—	—	84.3	107.4

Additional readings and notes: Zi-ka-wei gives also MN = +4.4m. Manila
MN = +7.2m. Kobe MN = +18.5m. Readings given as at 16h.
Osaka MN = +10.9m. Tokyo MN = +13.6m. Calcutta PN =
+7m.10s. Bergen e = +42m.35s. and +44m.5s. Hamburg MZ =
+52.8m., MN = +54.1m. De Bilt ePR₁Z = +16m.10s., MNZ = +56.5m.
Strasbourg MN = +64.8m. Uccle SR₁ = +29m.20s. Eskdalemuir
SR₁? = +33m.50s., MN = +57.3m. Moncalieri MN = +67.1m. Paris
MN = +63.3m. Toledo MNW = +65.3m. San Fernando MN = +64.5m.
Ottawa LE = +58.3m.

Oct. 27d. Readings also at 0h. (Lick), 1h. (near Tokyo and Mizusawa), 10h. (near Lick and Berkeley), 13h. (near Tacubaya and near Nagasaki), 14h. (Taihoku and Zi-ka-wei), 15h. (near Oaxaca), 16h. (near La Paz).

Oct. 28d. Readings also at 5h. (near Mizusawa), 7h. (Pilar and Andalgalá), 8h. (Cipolletti and La Paz), 11h. (Batavia), 17h. (De Bilt), 18h. (near Mostar), 19h. (Batavia), 22h. (La Paz and Nagasaki).

Oct. 29d. Readings at 0h. (La Paz (2), near Osaka, and Kobe, and near Balboa Heights), 1h. (Nagasaki), 11h. (near Lick), 13h. (near Manila), 18h. (Apia), 20h. (near Manila).

Oct. 30d. 13h. 5m. 30s. Epicentre $13^{\circ}5'N$, $143^{\circ}0'E$. (as on 1917 Nov. 24d.).

$$A = -.777, B = +.585, C = +.233; \quad D = +.602, E = +.799; \\ G = -.186, H = +.140, K = -.972.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Manila	21.4	276	e 5 2	- 4	(9 4)	-11	9.1	9.2
Osaka	22.3	343	5 3	- 6	—	—	—	10.7
Tokyo	22.4	353	6 8	-58	11 28	21	(11.5)	—
Zi-ka-wei	26.6	315	e 5 46	- 8	e 9 43	-50	—	16.8
Adelaide	48.6	185	—	—	—	e 19.0	—	25.5
Melbourne	51.3	178	—	—	e 19 18	?SR ₁	—	28.1
Victoria	82.4	41	—	—	—	—	39.5	45.9
Uccle	106.3	334	—	—	—	e 50.5	—	—
Strasbourg	106.4	330	—	—	—	e 57.5	—	—
Toronto	111.0	31	e 7 12	?	—	—	32.9	—
La Paz	149.8	100	19 56	[0]	—	—	—	—

Additional readings: Manila gives also MN -9.3m. Osaka MN = +12.4m. Adelaide eSR₂? = +15m.0s., e = +22m.42s. Toronto L = +15.7m.

Oct. 30d. Readings also at 1h. (Victoria and Toronto), 2h. (Ithaca, Georgetown, Ottawa, Chicago (2), Victoria, and Toronto), 3h. (Ottawa), 4h. (Florence), 6h. (Calcutta), 13h. and 22h. (Granada).

Oct. 31d. Readings at 1h. (near Nagasaki), 4h. (La Paz), 5h. (Zi-ka-wei, near Taihoku, and near Mizusawa), 13h. (Tiflis and near Mizusawa), 20h. (near Tokyo and Mizusawa) 21h. (near Osaka and Kobe), 22h. (near Mizusawa).

Nov. 1d. Readings at 0h. (De Bilt, Uccle, and Hong Kong), 5h. and 8h. (La Paz), 9h. (near Tokyo and Mizusawa), 17h. (near Mizusawa), 19h. (near Athens), 22h. (La Paz).

Nov. 2d. Readings at 1h. (near Tokyo), 4h. (Chicago), 16h. (Tokyo and near Mizusawa), 17h. (near Mizusawa), 18h. (La Paz).

Nov. 3d. 12h. 50m. 10s. Epicentre $7^{\circ}6'S$, $128^{\circ}3'E$. (as on 1921 Mar. 30d.).

$$A = -.614, B = -.778, C = -.132; \quad D = -.785, E = -.620; \\ G = +.082, H = -.104, K = -.991.$$

The depth of focus 0.040 as assumed for 1921 March 30d., is retained. See note at end.

		Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			°	°	m. s.	s.	m. s.	s.	m.	m.
Batavia	N.	-1.7	21.3	272	i 4 57	-21	—	—	—	—
Manila		-1.9	23.3	342	e 4 56	- 2	e 8 0	-53	i 8.8	9.0
Hong Kong		-2.8	32.9	336	7 59	?	—	—	—	—
Sydney		-2.9	33.7	143	11 50	?S	(11 50)	+ 2	18.0	19.3
Melbourne		-2.9	33.8	154	—	—	11 50	0	15.8	20.0
De Bilt		—	115.9	325	—	—	—	—	e 59.8	—
La Paz		—	150.9	146	19 50	- 7	—	—	61.9	—

Additional readings and notes: Manila gives also eS = -8m.0s. Melbourne SR₁ = +13m.8s. La Paz L is given as the P of another shock.

The evidence for this solution may not seem sufficient to warrant it, if the shock stood alone. But direct comparison with the shock of 1921 March 30 gives for the excess of the present readings

of P, Batavia +22s. Manila - 2s. La Paz [+10s.].
of S, Manila - 9s. Sydney -12s. Melbourne +12s.

It is difficult to treat these as other than accidental, and accordingly we may give this solution the benefit of the former copious evidence.

Nov. 3d. Readings also at 0h. (Zi-ka-wei), 2h. (near Lick), 15h. (near Taihoku and near Mizusawa), 16h. (Zi-ka-wei), 18h. (Cape Town and near Kobe), 19h. (De Bilt and Eskdalemuir), 22h. (near Mizusawa and Ootomari), 23h. (De Bilt).

Nov. 4d. 3h. 19m. 36s. Epicentre $40^{\circ}5'N$. $122^{\circ}0'W$. (as on 1920 Mar. 20d.).

A = -403, B = -645, C = +649; D = -848, E = +530;
G = -344, H = -551, K = -760.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Berkeley	2.6	186	e 0 39	- 2	e 1 3	- 9	i 1.7	2.9
Lick	3.1	174	i 1 31	?S	(i 1 31)	+ 5	i 2.0	5.5
Victoria	8.0	354	(2 12)	+11	—	—	2.2	3.7
Chicago	25.8	76	—	—	10 24	+ 6	14.2	—
Ann Arbor	28.5	74	—	—	—	—	e 14.5	—
Toronto	31.4	70	—	—	—	—	i 20.4	—
Ottawa	33.5	65	—	—	e 12 24	- 8	e 20.4	—
Georgetown N.	34.2	79	e 9 50	?PR ₁	—	—	22.9	—
Washington	34.2	79	—	—	—	—	19.9	—
Honolulu	36.0	250	—	—	e 14 19	?	15.4	16.5
Eskdalemuir	71.0	31	—	—	—	—	38.4	—
Stonyhurst	72.4	33	e 38 12	?L	—	—	(e 38.2)	—
De Bilt	76.7	30	—	—	—	—	e 37.4	—

Additional readings: Berkeley gives also eLN = +1.6m., iLZ = +1.7m.,
MN = +1.9m. Lick iPE = +1m.34s., MN = +2.7m. Victoria E
(Milne-Shaw), P = +1m.10s., L = +1.6m., M = +3.6m. Ottawa L =
+21.7m. Georgetown eLN = +20.2m. Honolulu LN = +15.5m.

Nov. 4d. 4h. 20m. 12s. Epicentre $37^{\circ}0'N$. $20^{\circ}5'E$. (as on 1922 July 2d.).

A = +748, B = +280, C = +602; D = +350, E = -937;
G = +564, H = +211, K = -799.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Athens	2.8	69	0 53	+ 9	—	—	i 1.8	2.3
Pompeii	5.9	311	1 48	+17	2 18	-23	—	5.3
Mostar	6.6	343	i 1 46	+ 5	i 3 13	+13	—	3.3
Rocca di Papa	7.6	311	i 2 0	+ 5	4 30	?L	(4.5)	4.6
Belgrade	7.8	0	i 1 31	-27	i 3 4	-27	—	3.8
Florence	9.8	317	2 34	+ 7	5 17	?L	(5.3)	7.3
Vienna	11.6	346	5 47	?L	8 42	?	i 9.5	11.2
	11.6	346	5 55	?L	8 52	?	i 9.4	11.8
Helwan	11.6	125	e 2 54	+ 1	(4 56)	-13	—	18.3
Moncalieri	12.4	314	3 2	- 3	5 23	- 6	7.2	11.6
Lemberg	13.1	10	e 3 19	+ 5	—	—	e 6.4	9.1
Marseilles	13.2	304	3 20	+ 4	6 2	+13	6.8	8.8
Zurich	13.6	324	e 3 17	- 4	i 5 47	-11	—	—
Algiers	13.9	275	i 3 23	- 2	6 16	+10	9.8	15.5
Besançon	14.8	318	e 3 34	- 2	—	—	7.8	—
Strasbourg	14.9	326	3 31	- 7	6 30	0	7.3	11.7
Barcelona	14.9	293	e 3 31	- 4	e 6 34	+ 4	6.8	10.6
Tortosa N.	16.0	290	3 47	- 5	6 45	-10	8.1	15.4

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Paris		17.6	318	e 4 36	+24	—	—	9.8	10.8
Konigsberg	E.Z.	17.8	0	i 4 10	-5	7 27	-9	e 8.8	11.8
	N.	17.8	0	i 4 16	+1	7 29	-7	e 10.8	11.8
Uccle		18.0	325	e 4 16	-1	e 7 31	-9	9.6	11.6
Hamburg		18.1	340	i 4 16	-2	i 7 40	-2	e 10.2	12.8
De Bilt		18.5	330	4 24	+1	7 52	+1	9.8	13.8
Gratiada		19.2	278	i 4 32	+1	i 8 6	0	12.8	17.9
Tiflis		19.3	68	5 13	+40	8 37	+29	12.3	13.6
Toledo		19.4	286	4 35	+1	8 5	-5	e 12.4	15.5
Kew		20.6	321	7 48	?S	(7 48)	-48	—	16.8
Oxford		21.3	321	4 55	-2	8 38	-12	—	—
San Fernando		21.4	277	4 54	-4	8 54	+1	—	20.1
Coimbra	E.	22.8	287	4 56	-19	8 54	-27	14.3	15.6
	N.	22.8	287	—	—	i 9 1	-20	e 11.3	16.2
Upsala		22.9	357	i 5 6	-10	i 9 9	-14	e 11.6	16.8
Stonyhurst		23.1	324	—	—	—	—	9.8?	14.1
Bidston		23.2	323	6 11	+52	10 10	+41	—	18.4
Eskdalemuir		24.4	326	i 4 54	-38	i 9 2	-50	12.4	14.0
Edinburgh		24.7	328	5 28	-7	i 9 44	-13	13.8	20.3
Dyce	N.	25.2	331	5 35	-5	9 40	-27	—	14.0
Bergen		25.3	343	—	—	e 9 48	-21	14.8	—

Additional readings: Athens gives also PE = +1m.6s., iP = +1m.9s., MN = +2.0m., T₀ = 4h.19m.57s. Mostar iPN = +48s. Rocca di Papa SN = +4m.24s., eL = +11.3m. Belgrade iPN = +58s. Vienna gives two sets of readings, the first being partly E and partly Z, the other N, also we have iN = +6m.38s., +7m.26s., and +7m.57s., MZ = +10.6m. Helwan S is given as PR₁, also S = +9m.48s. Moncalieri MN = +9.3m. Strasbourg PV = +3m.33s., PN = +3m.36s., and PE = +3m.37s., MN = +10.0m. Barcelona MN = +11.2m. Konigsberg PZ, MZ, SE, LE are entered in the line EZ. Uccle P = +4m.20s. De Bilt MN = +13.9m., MZ = +14.2m. Granada MN = +15.9m. Tiflis e = +11m.6s., MN = +12.9m. Toledo MNW = +17.2m. San Fernando MN = +13.3m. Upsala MN = +15.8m. Eskdalemuir MN = +13.8m.

Nov. 4d. Readings also at 4h. (near Mizusawa and Tokyo), 5h. (La Paz, Chicago (2), Porto Rico and near Port au Prince), 10h. (near Marseilles and near Mizusawa), 18h. (Hong Kong, Manila, and Zi-ka-wei), 19h. (De Bilt), 21h. (near Mazatlan).

Nov. 5d. 23h. 26m. 20s. Epicentre 39° 08. 17° 0W. (as on 1921 Feb. 13d.).

A = +.743, B = -.227, C = -.629; D = -.292, E = -.956;
G = -.602, H = +.184, K = -.777.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Pilar	E.	38.5	270	7 34	-8	—	—	20.5	26.6
	N.	38.5	270	7 40	-2	—	—	21.2	24.3
Cipolletti		39.2	256	15 16	?S	(15 16)	+82	19.8	22.4
Mendoza		41.5	265	14 28	?S	(14 28)	0	21.9	26.7
La Paz		49.7	282	9 3	-2	i 16 22	+7	24.7	29.4
Uccle		91.8	13	—	—	—	—	—	55.7
De Bilt		93.1	16	—	—	—	—	58.7	—
Zi-ka-wei	Z.	145.4	90	e 20 14	[+25]	—	—	—	—

No additional readings.

Nov. 5d. Readings also at 1h. (Port au Prince), 2h. (Kobe), 3h. (Florence), 5h. (near Mizusawa), 9h. (Zi-ka-wei), 15h. (Sinj), 17h. (La Paz), 18h. (2) and 19h. (Lick).

Nov. 6d. Readings at 17h. (Tiflis), 23h. (Granada and Edinburgh).

1922. Nov. 7d. 23h. 0m. 12s. Epicentre 27°-5S. 72°-8W.

A = +.262, B = -.847, C = -.462; D = -.955, E = -.296;

G = -.137, H = +.441, K = -.887.

This solution was made before any observations had been received from S. American stations other than La Paz and Rio de Janeiro. The negative residuals shown by all the additional stations except Cipolletti are striking, and suggest an epicentre further east, but the testimony of Rio de Janeiro against this change is strong.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
				m. s.	s.	m. s.	s.	m.	m.
Andalgala	N.	5.8	93	0 0	-90	—	—	0.6	2.5
Mendoza		6.6	146	0 0	-101	—	—	1.1	2.9
La Quiaca	E.	8.4	52	1 12	-55	—	—	2.6	5.3
	N.	8.4	52	1 6	-61	—	—	2.5	3.9
Pilar	E.	8.8	121	1 42	-31	—	—	2.2	6.5
	N.	8.8	121	1 54	-19	—	—	2.5	6.9
La Paz		11.8	22	2 59	+ 3	i 5 19	+ 5	6.6	7.5
Cipolletti		12.1	162	3 24	+ 24	—	—	5.9	11.1
Chacarita	E.	14.2	123	3 0	-29	—	—	6.9	—
	N.	14.2	123	3 12	-17	—	—	6.8	—
Rio de Janeiro		27.2	87	6 0	0	10 42	- 3	14.3	15.7
Vera Cruz		51.9	332	9 0	-19	16 46	+ 3	24.4	29.4
Tacubaya	E.	53.4	329	9 34	+ 5	17 14	+13	25.2	30.4
Georgetown	E.	66.5	357	i 10 55	0 e	19 45	+ 1 e	30.8	—
Washington		66.5	357	10 50	- 5	19 41	- 3	34.0	—
Ithaca		70.1	358	e 11 48	+30	20 30	+ 3	34.8	—
Chicago		70.6	350	11 16	- 5	20 23	-10	34.0	—
Ann Arbor		70.6	353	11 18	- 3	20 24	- 9	34.0	—
Toronto		71.4	355	10 6	-80	21 42	+59 i	31.0	52.4
Northfield		71.7	1	11 28	0	20 49	+ 3 e	44.8	—
Ottawa		73.0	358	11 35	- 1	20 58	- 4 e	30.8	—
Cape Town		76.0	122	21 28	?S	(21 28)	- 9	—	41.5
Lick	E.	79.4	323	e 12 28	+13	i 22 22	+ 6	i 39.3	44.7
Berkeley		80.2	323	e 12 33	+13	—	—	i 40.6	—
Johannesburg		86.9	118	—	—	—	—	43.8	—
Wellington		87.0	225	e 12 48	-11	i 23 48	+ 7	40.6	44.8
Victoria	E.	88.3	330	12 43	-24	23 17	-38	39.6	50.6
		88.3	330	13 8	+ 1	23 33	-22	39.8	50.4
San Fernando		89.5	48	12 56	-17	23 30	-39	—	61.0
Rio Tinto		90.0	47	15 48	+152	—	—	—	62.8
Coimbra		90.3	44	e 12 38	-40	22 48	-89 e	40.8	52.2
Granada		91.6	49	i 13 11	-14	23 58	-33	41.7	47.0
Toledo		92.9	46	13 13	-19	23 46	-58 e	41.2	48.8
Honolulu	E.	95.7	291	24 15	?S	(24 15)	-58	44.7	46.8
Algiers		95.9	51	e 13 26	-22	24 3	-72	41.8	54.8
Tortosa		96.3	47	e 12 48	-63	24 8	-71	38.2	59.0
Barcelona		97.7	48	—	—	—	—	e 42.8	55.8
Le Mans		99.8	41	—	—	—	—	57.8	—
Marseilles		100.6	47	—	—	e 25 8	-53 e	39.8	56.8
Oxford		100.9	38	—	—	i 24 29	-95	44.0	62.2
Kew		101.3	38	—	—	—	—	—	65.8
Stonyhurst		101.4	36	e 14 24	+ 7	24 48	-81	—	58.3
Paris		101.5	41	—	—	—	—	49.8	53.8
Eskdalemuir		101.8	34	e 18 13	?PR ₁	24 32	-101	43.8	46.8
Besançon		102.8	44	—	—	e 27 49?	+87	47.8	—
Moncalieri		102.9	46	24 5	?S	(24 5)	-138	48.2	62.9
Dyce	N.	103.3	32	—	—	i 24 43	-104	43.6	58.1
Uccle		103.5	40	—	—	e 24 43	-106 e	43.8	60.0
De Bilt		104.5	40	e 14 10	-22	e 24 48	-110	44.8	59.0
Strasbourg		104.5	43	—	—	e 27 48	+70 e	44.8	68.3
Florence		104.7	48	18 42	?PR ₁	—	—	33.3	60.3
Rocca di Papa		104.8	50	e 18 12	?PR ₁	24 48	-112 e	52.8	64.6
Melbourne		105.7	210	—	—	—	—	—	58.5
Sydney		105.8	217	—	—	—	—	52.7	57.0
Innsbruck		106.2	45	—	—	—	—	e 50.8	—
Hamburg		107.8	39	e 18 48	?PR ₁	—	—	e 51.8	60.8
Vienna		109.7	45	19 0	?PR ₁	28 30	+65 e	49.8	65.8
Konigsberg		114.1	40	—	—	29 18	+75 e	53.5	59.5
Helwan		114.7	70	19 34	?PR ₁	29 24	+76	—	72.7
Tiflis		127.9	57	e 31 16	?	—	—	e 52.8	73.6

Continued on next page.

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Batavia	146.3	178	i 19 45	[- 5]	—	—	—	—
Kodaikanal	147.1	117	19 42	[- 9]	—	—	77.7	88.3
Bombay	147.4	98	e 71 21	?L	—	—	(e 71.4)	—
Mizusawa	E. 149.6	300	20 0	[+ 5]	20 23	?	—	—
Tokyo	151.3	295	e 20 35	[+ 37]	—	—	—	—
Simla	153.7	75	—	—	—	—	e 82.5	—
Manila	161.8	228	20 5	[- 4]	—	—	—	—
Zi-ka-wei	167.1	290	e 15 0	?	—	—	—	—

Additional readings and notes: Tacubaya LN = +25.4m., MN = +30.5m.
 Georgetown iSN = +19m.46s., LE = +40.8m., LN = +39.8m. Ithaca
 L = +38.8m. and +41.8m. Chicago L = +39.5m. Ann Arbor L =
 +37.8m. Toronto L = +51.2m., eL = +56.5m., +75.8m., and +87.0m.
 Ottawa eLN = +33.8m., L = +42.8m., T_0 = 23h.0m.23s. Lick i =
 +34m.18s. Berkeley iPE = +12m.53s., iSR₁EN = +28m.48s., iSR₂E =
 +32m.6s. Wellington ePR₁ = +16m.6s., e = +22m.30s., and +26m.18s.,
 SR₁ = +29m.48s., SR₂ = +33m.24s., e = +35m.36s. San Fernando MN =
 +54.6m., T_0 = 23h.0m.31s. Coimbra iE = +23m.44s., iN = +23m.52s.,
 eLN = +37.8m., T_0 = 23h.0m.37s. Toledo MNW = +46.1m. Honolulu
 PR₁E = +26m.21s., PR₁N = +26m.53s., eN = +37m.13s., LN = +44.6m.,
 MN = +46.4m. Algiers MN = +50.3m. Paris e = +32m.48s. and
 +40m.48s. Moncalieri S = +35m.30s., MN = +59.3m. Dyce iN =
 +33m.48s. Uccle MN = +59.4m. De Bilt ePR₁Z = +18m.23s., MN =
 +58.4m., MZ = +59.3m. Strasbourg e = +18m.18s., MN = +66.7m.
 Rocca di Papa PN = +18m.48s., eS = +24m.54s. Hamburg MNZ =
 +61.9m. Königsberg MN = +63.8m. Tiflis MN = +63.4m. Simla
 ePN = +75m.36s. (?eLN).

Nov. 7d. Readings also at 4h. (Nagasaki and near Marseilles), 5h. (Nagasaki (2)
 and near Batavia), 7h. (Stonyhurst), 9h. (Batavia), 17h. (Batavia),
 20h. (Sinj), 22h. (near Batavia). But see also Appendix.

Nov. 8d. 10h. 28m. 28s. Epicentre 46°·0N. 12°·0E.

$$A = +.679, B = +.144, C = +.719.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Innsbruck	1.3	i 0 18	- 2	e 0 35	- 1	—	—
Chur	1.9	0 30	+ 1	0 53	0	—	—
Zurich	2.7	e 0 45	+ 3	i 1 20	+ 6	—	—
Vienna	3.7	i 1 10	+ 12	—	—	i 1.9	2.2

Zurich gives also iP = +46s., iV = +57s.

Nov. 8d. 20h. 16m. 20s. Epicentre 36°·0N. 141°·0E. (as on 1922 June 25d.).

$$A = -.629, B = +.509, C = +.588; \quad D = +.629, E = +.777; \\ G = -.457, H = +.370, K = -.809.$$

	Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tokyo	1.1	253	i 0 14	- 3	0 26	- 5	—	0.5
Mizusawa	N. 3.1	1	0 49	0	1 47	+ 21	—	—
Nagoya	3.4	256	0 51	- 2	1 31	- 3	—	—
Osaka	4.7	256	1 18	+ 5	(2 18)	+ 9	2.3	2.6
Kobe	5.0	256	1 22	+ 5	(2 12)	- 5	2.2	2.6

Additional readings: Mizusawa gives also ME = +50s. Osaka MN =
 +2.8m., all readings given as on 7d. Kobe S = +1m.55s. (O - C = -22s.),
 MN = +2.4m.

Nov. 8d. 23h. 33m. 40s. Epicentre $6^{\circ} \cdot 7S$. $12^{\circ} \cdot 0W$.

$$A = + \cdot 971, B = - \cdot 206, C = - \cdot 117; \quad D = - \cdot 208, E = - \cdot 978; \\ G = - \cdot 114, H = + \cdot 024, K = - \cdot 993.$$

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
San Fernando	43.5	8	14 32	?S	(14 32)	-23	(18.0)	23.8
Granada	44.6	10	i 8 24	- 6	16 57	+107	—	29.3
Algiers	45.7	19	e 8 29	- 9	15 13	-11	23.3	24.5
Coimbra	E. 47.0	4	10 14	?PR ₁	18 18	?SR ₁	21.8	—
	N. 47.0	4	e 10 34	?PR ₁	—	—	e 22.8	—
Toledo	47.1	9	8 23	-25	18 44	+182	—	—
Tortosa	E. 48.9	13	—	—	—	—	e 23.3	25.7
Barcelona	49.9	15	—	—	18 51	+153	e 24.6	—
Rocca di Papa	53.5	24	i 9 26	- 4	17 8	+ 5	e 28.3	29.8
Moncalieri	54.6	17	9 48	+11	18 18	+62	27.1	—
La Paz	55.7	258	9 47	+ 3	17 20	-10	26.3	31.9
Strasbourg	57.9	16	—	—	—	—	e 30.0	—
Kew	59.0	9	—	—	—	—	—	38.3
Uccle	59.2	12	—	—	e 18 14	+ 1	e 28.3	—
Belgrade	59.2	28	e 9 10	-56	e 18 6	- 7	e 28.0	—
Vienna	Z. 60.3	22	e 10 15	+ 1	—	—	—	—
De Bilt	60.6	13	10 18	+ 2	18 37	+ 6	e 30.3	—
Eskdalemuir	62.4	7	—	—	e 18 51	- 2	e 25.3	—
Edinburgh	63.0	7	—	—	—	—	e 26.3	—
Ottawa	77.0	321	—	—	—	—	e 35.3	—
Toronto	78.7	319	—	—	—	—	—	59.5
Victoria	109.1	320	—	—	—	—	68.3	72.9

Additional readings: San Fernando gives also MN = +23.7m. Rocca di
Papa iPE = +9m.32s. Paris ($\Delta = 57^{\circ} \cdot 0$) gives 23h.48m.

Nov. 8d. Readings also at 0h. (Colombo), 1h. (Athens), 6h. (near Granada), 7h. (Athens), 9h. (La Paz), 11h. (Melbourne), 12h. (Strasbourg), 14h. and 20h. (near Tokyo), 22h. (near Zurich and Chur), 23h. (Paris and La Paz).

Nov. 9d. Readings at 0h. (Kodaikanal), 1h. (De Bilt and Uccle), 2h. (Manila), 9h. (near Zurich), 11h. (near Merida), 12h. (near Victoria), 21h. (Batavia).

Nov. 10d. 12h. 24m. 12s. Epicentre $13^{\circ} \cdot 5N$. $143^{\circ} \cdot 0E$. (as on 1922 Oct. 30d.).

$$A = - \cdot 777, B = + \cdot 585, C = + \cdot 233; \quad D = + \cdot 602, E = + \cdot 799; \\ G = - \cdot 186, H = + \cdot 140, K = - \cdot 972.$$

The evidence is so slight that the old epicentre has been retained, but a position at $12^{\circ} \cdot 5N$. $139^{\circ} \cdot 0E$. would suit the observations better, with $T_0 = 12h.24m.50s$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Manila	21.4	276	e 6 3	+65	—	—	7.0	10.1
Zi-ka-wei	26.6	315	e 6 7	+13	e 10 25	- 8	—	—
Hong Kong	28.8	292	6 23	+ 7	—	—	8.9	10.3
Batavia	41.0	244	—	—	e 14 16	- 5	—	—
De Bilt	105.0	335	—	—	—	—	e 52.8	62.3
Uccle	106.3	334	—	—	—	—	e 49.8	—

Additional readings: Manila gives also MN = +7.4m. De Bilt MN = +62.0m., MZ = +62.2m.

Nov. 10d. Readings also at 9h. (Nagasaki), 11h. and 12h. (near Tokyo and Mizusawa), 14h. (near Balboa Heights), 18h. (Rio Tinto), 20h. (near Tokyo and Mizusawa), 21h. (La Paz).

1922. Nov. 11d. 4h. 32m. 30s. Epicentre 29°OS. 71°OW.
 $A = +.285, B = -.827, C = -.485; D = -.946, E = -.326;$
 $G = -.158, H = +.458, K = -.875.$

The epicentre appears to be definitely different from that on November 7 (See note at end of these observations). But there are several severe after-shocks.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Pilar		6.7	115	—	—	—	—	2.3	5.4
La Quiaca	N.	8.4	36	(1 6)	-61	—	—	1.1	5.3
Cipolletti		10.3	167	—	—	—	—	6.3	—
Chacarita	E.	12.0	121	2 42	-17	—	—	3.9	—
	N.	12.0	121	2 48	-11	—	—	4.2	—
La Paz		12.8	13	3 10	0	—	—	—	—
Rio de Janeiro		25.7	83	i 5 30	-15	10 6	-10	13.5	—
Balboa Hts.	E.	38.9	348	7 56	+11	13 44	-7	16.9	17.3
	N.	38.9	348	7 30	-15	13 38	-13	17.0	21.1
	E.	38.9	348	7 40	-5	13 10	-41	17.1	17.5
	N.	38.9	348	7 34	-11	13 30	-21	16.7	17.3
Porto Rico	E.	47.5	7	e 8 41	-10	e 15 42	-6	24.0	29.8
	E.	47.5	7	e 8 35	-16	15 20	-28	e 25.8	31.5
Port au Prince	N.E.	47.6	359	e 8 36	-15	15 30	-19	25.1	28.6
	N.W.	47.6	359	i 8 45	-6	—	—	—	32.6
Oaxaca		52.4	330	8 34	-48	(15 58)	-51	16.0	31.0
Merida		53.1	340	8 36	-51	15 57	-60	19.3	22.3
	Z.	53.1	340	8 34	-53	15 55	-62	19.2	22.3
Vera Cruz		54.0	331	9 32	-1	17 12	+3	21.6	28.3
	Z.	54.0	331	9 32	-1	17 9	0	21.6	28.2
Puebla		54.8	330	11 36	+118	19 21	+122	27.6	30.6
Tacubaya	E.	55.5	328	9 46	-3	14 24	-184	21.0	29.5
	N.	55.5	328	9 44	+1	17 25	-3	23.5	26.8
	Z.	55.5	328	9 47	+4	17 26	-2	24.5	26.9
Colima	E.	56.8	322	23 0	?	31 30	?L	37.5	41.0
	N.	56.8	322	—	—	—	—	37.6	41.2
Mobile		61.9	345	—	—	18 22	-25	30.8	—
Mazatlan	E.	62.4	324	9 12	-76	18 16	-37	25.7	30.5
	N.	62.4	324	9 18	-70	18 20	-33	25.6	30.6
Cheltenham	E.	68.0	356	e 11 17	+13	19 46	-16	e 34.3	37.8
	N.	68.0	356	11 1	-3	19 46	-16	e 35.1	42.0
Georgetown	E.	68.2	355	e 11 11	+6	20 2	-2	e 28.2	37.9
	N.	68.2	355	i 11 7	+2	20 2	-2	e 29.0	39.7
Washington		68.2	355	11 2	-3	20 0	-4	33.8	—
Ithaca		71.7	356	11 22	-6	20 37	-9	32.0	—
Tucson	E.	72.0	325	e 11 35	+5	20 56	-6	e 34.5	39.0
	N.	72.0	325	e 11 30	0	20 56	+6	e 34.8	38.8
Ann Arbor		72.3	351	11 36	-4	20 48	-6	34.8	33.1
Chicago		72.5	348	11 30	-3	20 37	-19	—	34.5
Toronto		73.0	354	11 24	-12	20 48	-14	i 36.0	57.2
Northfield		73.2	359	11 36	-1	21 3	-1	36.5	—
Cape Town		73.9	120	11 49	+8	21 16	+3	34.8	48.0
Halifax		74.0	5	e 12 3	+21	21 30	+16	e 36.0	—
Ottawa		74.5	357	i 11 40	-6	21 12	-8	e 35.9	40.0
Denver		75.6	333	11 30?	-23	20 30?	-63	30.5?	46.5?
Lick	E.	81.6	321	e 12 27	-1	e 22 28	-4	i 34.6	38.5
	N.	81.6	321	i 12 33	+5	22 38	-4	i 34.4	40.6
Berkeley	E.	82.7	321	e 12 27	-7	22 51	-3	e 34.2	39.7
	N.	82.7	321	e 12 24	-10	26 39	?	34.7	39.2
	Z.	82.7	321	e 12 42	-8	—	—	—	39.9
Johannesburg		84.8	117	12 48	+1	23 6	-11	35.5	49.5
Christchurch		87.0	220	12 42	-17	23 24	-17	41.9	43.6
Wellington		87.1	225	12 54	-6	i 23 0	-42	39.6	46.5
San Fernando		89.3	46	13 12	0	24 24	+18	41.7	57.2
Rio Tinto		89.9	45	15 30	+135	—	—	—	71.5
Coimbra	E.	90.4	42	12 44	-34	23 38	-40	38.2	45.9
	N.	90.4	42	—	—	23 30	-48	38.7	43.1
Victoria		90.5	329	13 27	+8	24 21	+2	45.7	49.6
	E.	90.5	329	13 10	-9	23 42	-37	38.7	49.4
	Z.	90.5	329	13 10	-9	24 5	-14	42.7	47.4
Granada		91.4	47	i 13 16	-7	24 5	-23	i 29.4	47.5
Apia		92.5	254	13 29	-1	24 33	-7	43.0	44.5
Toledo		92.8	45	13 19	-12	24 11	-32	e 41.1	51.1
Algiers		95.6	50	13 34	-13	24 21	-51	43.5	50.5
Tortosa		96.2	46	13 28	-22	24 30	-48	40.9	59.4

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Barcelona		97.5	46	e 13 27	-30	24 31	-60	41.2	53.6
Honolulu	E.	97.8	290	e 13 55	-4	i 24 55	-39	41.2	45.5
	N.	97.8	290	e 14 0	+1	—	—	41.0	47.4
Le Mans		99.6	40	e 17 30	?PR ₁	i 24 55	-57	—	65.4
Puy de Dôme		100.2	43	14 8	-4	25 20	-38	46.7	—
Marseilles		100.5	46	e 14 0	-13	25 0	-61	42.8	55.8
West Bromwich		101.2	36	13 52	-24	25 6	-61	—	—
Bidston		101.2	35	15 10	+54	25 48	-19	—	75.5
Oxford		101.4	37	13 56	-21	24 50	-79	42.5	63.5
Kew		101.5	37	14 30	+12	—	—	—	62.5
Sitka	E.	101.6	330	—	—	25 15	-56	e 47.8	54.4
	N.	101.6	330	—	—	e 26 8	-3	49.8	47.2
Paris		101.6	40	e 14 4	-14	e 25 13	-58	45.5	56.5
Stonyhurst		101.7	35	14 6	-13	25 6	-66	46.7	55.7
Edinburgh		102.5	32	e 14 2	-21	i 24 58	-82	42.5	52.8
Moncalieri		102.8	45	13 51	-33	24 55	-87	35.0	59.5
Besançon		102.8	42	14 4	-20	25 18	-64	62.5	—
Uccle		103.6	39	14 5	-23	i 25 22	-67	43.5	59.6
Dyce	N.	103.7	30	14 5	-24	25 2	-88	—	46.3
Zurich		104.4	44	e 14 23	-9	e 25 24	-73	—	—
Florence		104.5	47	14 8	-24	25 20	-78	44.0	67.5
Rocca di Papa	E.	104.5	50	e 14 23	-9	e 25 18	-80	43.5	63.5
	Z.	104.5	50	e 14 13	-19	e 27 30	+52	e 52.5	—
Strasbourg		104.5	42	14 8	-24	25 35	-63	44.5	57.5
De Bilt		104.7	39	14 12	-21	e 25 26	-73	e 43.5	66.3
Melbourne		105.2	209	14 18	-17	25 0	-104	47.0	58.7
Pompeii		105.3	51	e 13 51	-45	25 30	-75	34.5	71.5
Sydney		105.5	215	13 36	-61	24 48	-119	50.0	56.5
Riverview		105.5	215	e 12 42	-115	e 24 42	-125	e 45.0	57.0
Innsbruck		106.1	43	e 14 31	-9	e 25 34	-79	e 42.2	62.2
Hamburg		108.0	38	e 14 26	-22	e 28 30	+80	e 50.5	58.9
Bergen		108.6	30	14 36	-15	28 34	+79	e 50.8	58.6
Mostar		108.7	49	—	—	—	—	54.4	—
Vienna		109.6	44	e 14 40	-15	27 26	+2	e 44.8	61.5
Adelaide		110.2	206	e 5 30	?	i 27 30	0	e 45.5	56.0
Athens		110.7	58	e 18 41	?PR ₁	29 5	+91	e 49.5	72.0
Belgrade		110.9	49	e 14 56	-6	i 26 36	-60	38.2	66.5
Helwan		113.8	69	14 56	-19	—	—	—	69.5
Upsala		114.1	33	e 16 0	+44	i 29 19	+76	e 47.0	59.8
Konigsberg		114.2	39	e 16 27	+70	—	—	e 47.3	55.0
Lemberg		114.8	45	e 19 0	[+23]	e 30 0	+112	e 47.2	69.7
Perth		118.7	187	20 36?	?PR ₁	35 9	?	62.4	81.6
Tiflis		127.1	57	e 19 56	[+45]	—	—	e 43.6	66.2
Malabar		143.7	177	i 19 44	[-2]	—	—	73.6	—
Batavia		144.7	174	i 19 44	[-4]	—	—	73.4	75.3
Colombo		144.7	122	(20 0)	[+12]	20 0	?P	76.0	82.5
Kodaikanal		145.0	117	—	—	—	—	78.9	92.3
Bombay		145.6	97	19 57	[+8]	37 18	?	74.8	78.6
Ootomari		148.4	314	18 47	[-66]	41 58	?SR ₁	61.8	72.5
Mizusawa	E.	151.7	300	20 7	[+9]	42 42	?SR ₁	—	—
	N.	151.7	300	20 5	[+7]	43 1	?SR ₁	—	—
Simla		152.5	78	20 12	[+12]	34 48	?	81.3	93.8
Tokyo		153.3	293	20 4	[+4]	34 22	?	70.5	76.4
Nagoya		155.6	292	20 5	[+2]	—	—	—	—
Osaka		156.9	291	20 22	[+17]	44 17	?SR ₁	64.3	90.8
Kobe		157.2	291	20 8	[+3]	31 42	?	45.4	92.8
Calcutta	E.	160.3	104	20 22	[+14]	31 58	?	—	—
	N.	160.3	104	20 10	[+2]	32 8	?	—	—
Manila		161.8	220	20 12	[+3]	—	—	78.5	88.5
Nagasaki		161.8	287	20 14	[+5]	—	—	45.8	88.1
Taihoku		168.2	253	20 27	[+13]	32 21	?	46.0	101.4
Zi-ka-wei		169.3	285	e 20 34	[+20]	e 32 0	?	—	94.9
Hong Kong		171.9	216	20 20	[+4]	—	—	—	73.5

Additional readings and notes: Rio de Janeiro readings have been diminished by 1h. Porto Rico gives also PR₁ = +10m.43s., eN = +13m.11s., PSE? = +16m.8s., SR₁E = +18m.45s., eSR₁N = +19m.7s., LE = +25.7m., eLN = +29.5m., iN = +27m.5s., T₀ = 4h.32m.34s. Port au Prince eP = +8m.33s. Vera Cruz SN = +17m.10s. Mobile ePEN = 4h.24m.40s. Mazatlan MZ = +30.4m., all readings increased by 1h.20m. Cheltenham PR₁N = +14m.4s., PR₂N = +15m.39s., PSE? = +20m.19s., SR₁EN = +25m.9s., SR₂E = +27m.23s., eSR₂N = +27m.48s., eLE = +37.0m., eLN = +40.7m., T₀ = 4h.32m.46s. Ithaca SR₁ = +26m.12s. and several L's. Tucson PSE? = +21m.37s., PSN? = +21m.24s., SR₁E = +26m.15s., SR₂EN =

Continued on next page.

+29m.34s., eE = +30m.45s., eN = +31m.9s., LE = +37.5m., and +38.3m., LN = +36.6m., T₀ = 4h.32m.33s. Ann Arbor MN = +39.1m., T₀ = 4h.32m.54s. Toronto i = +14m.30s., i = +30m.48s., and +32m.30s., iL = +52.9m. and +53.2m., T₀ = 4h.32m.29s. Halifax PR₁E = +16m.53s., SR₂?E = +29m.58s., LE = +47.0m. and +72.0m., T₀ = 4h.32m.58s. Ottawa SR₂? = +30m.30s., MN = +43.5m., T₀ = 4h.32m.37s. Denver MN = -43.5m. All readings have been diminished by 1h. Lick iPR₁EN = +15m.57s., iPSE = +23m.47s., i? = +26m.47s., iSR₁E = +27m.38s., iSR₁N = +28m.20s., MZ = +39.3m. Berkeley iPZ = +12m.50s., PSN = +23m.17s., and +24m.1s., PSE = +23m.55s., SR₁N = +28m.4s., SR₁E = +28m.9s., SR₁N? = +28m.26s., SR₁E = +31m.51s., SR₁N = +31m.53s. Johannesburg S has been increased by 10m. Christchurch PR₁ = +16m.48s., SR₁ = +30m.18s. Wellington PR₁ = +16m.48s., SR₂ = +32m.24s. San Fernando MN = +56.7m. Coimbra PR₁ = +16m.50s., PR₂ = +19m.46s., iE = +24m.24s., and +26m.6s., iN = +24m.46s., and +25m.32s., SR₁E = +29m.38s., SR₁ = +34m.20s., T₀ = 4h.32m.25s. Victoria T₀ = 4h.32m.59s., the second line in the table for this station gives the M-S readings from which T₀ = 4h.33m.5s. was deduced. Granada PS = +24m.55s., MN = +43.4m., T₀ = 4h.32m.54s. Apia PR₁ = +17m.23s., a reading +26m.6s., SR₁ = +31m.56s., T₀ = 4h.33m.2s. Toledo PR₁NE = +16m.38s., PR₁NW = +16m.48s., PR₂NE = +19m.10s., PR₂NW = +20m.27s., PR₂NE = +20m.53s., SR₁NW = +30m.57s., SR₁NE = +31m.7s., SR₂NE = +34m.46s., SR₂NW = +34m.52s., SR₂NW = +38m.7s., SR₂NE = +38m.31s., MNW = +50.2m. Tortosa SE = +24m.19s. Barcelona PS? = +25m.54s., MN = +60.2m., T₀ = 4h.32m.58s. Honolulu PR₁ = +17m.51s., i = +18m.10s., PR₂ = +20m.14s., iE = +32m.30s., iPS = +27m.2s., SR₁E = +31m.15s., SR₁N = +31m.20s., SR₂E = +37m.45s., SR₂N = +36m.55s., LEN = +44.9m., L (rep.) E = +99.8m., L (rep.) N = +99.7m. Marseilles PR₁ = +17m.50s. Oxford PR₁ = 17m.54s. Sitka PR₁E = +18m.13s., ePR₁N = +17m.48s., PR₂E = +20m.32s., eE = +24m.12s., eN = +24m.40s., PSE? = +26m.50s., SR₁E = +32m.35s., SR₁N = +32m.47s., SR₂E = +36m.48s., SR₂N = +36m.44s., eN = +40m.35s., LE = +51.2m., LN = +53.5m., T₀ = 4h.32m.38s. Paris PR₁ = +18m.8s., MN = +47.5m. Uccle PR₁ = +18m.24s., i = +28m.11s., MN = +60.7m. Rocca di Papa iPZ = +14m.19s., ePN = +14m.24s., eL = +52.5m. Strasbourg PN = +14m.10s., MN = +62.5m., T₀ = 4h.33m.5s. De Bilt MN = +64.8m., T₀ = 4h.32m.37s. Sydney PR₁ = +18m.30s., SR₁ = +31m.30s. River-view ePR₁ = +16m.50s., PS = +25m.42s., e = +28m.27s., +28m.59s., +33m.36s., and +34m.23s., eL = +45.7m., MZ = +51.3m., MN = +56.3m., T₀ = 4h.30m.42s. Innsbruck MNW = +68.0m. Hamburg ePR₂Z = +18m.13s., ePR₂N = +18m.47s., ePR₁E = +18m.57s., iPR₁E = +19m.20s., iPR₁Z = +19m.22s., SR₁Z = +38m.1s., MN = +61.4m., MZ = +61.6m. Bergen PR₁ = +20m.0s., SR₁ = +35m.2s., iE = +67m.22s., L = +115.0m., M = +136.8m. Mostar eL = +37.8m., L = +46.6m. Vienna i = +19m.58m., iN = +19m.7s., iPR₁ = +19m.31s., i = +23m.33s., PSZ = +25m.32s., iPSE = +25m.39s., PSN = +25m.47s., iE = +28m.53s., PSN = +29m.9s., PSE = +29m.24s., PSZ = +29m.29s., SR₁E = +34m.47s., MN = +40.5m., Adelaide e = 4h.25m.0s.? eS? = +19m.30s., e = +23m.30s., iSR? = +25m.30s., i = +29m.30s., eSR₁? = +31m.30s., i = +34m.30s. Athens ePN = +19m.3s., PR₁ = +19m.15s., SR₁ = +35m.9s., MN = +55.2m. Belgrade PR₁ = +18m.10s., +20m.21s., +20m.53s., and +21m.58s., SR₁ = +29m.19s., MN = +57.6m. Helwan PR₁ = +19m.30s. Upsala PR₁ = +20m.9s., MN = +53.3m. Königsberg PR₂? = +16m.52s., SR₁N = +29m.57s., SR₂N = +35m.40s., SR₃N = +39m.0s., Perth PR₁ = +15m.23s., PR₂ = +27m.51s., PR₃ = +31m.40s., SR₁ = +37m.23s., SR₂ = +42m.30s., SR₃ = +46m.49s. Tifis gives several other e readings. Malabar iN = +25m.38s., iE = +42m.25s., LE = +52.4m. Batavia i = +19m.55s., +27m.16s., +36m.4s., and +48m.49s. Colombo P = 4h.27m.30s. Kodaikanal L has been increased by 1h. Ootomari MN = +90.4m. Simla SN = +38m.48s., LN = +63.7m. Tokyo PR₁ = +25m.40s., PR₂ = +29m.17s., PR₃ = +31m.49s., PS = +37m.39s., eSR₁ = +46m.3s., SR₂ = +49m.38s. Osaka MN = +91.0m. Kobe MN = +91.0m. Manila MN = +87.5m. Zi-ka-wei SR₁N = +47m.10s., SR₁E = +48m.28s., MN = +103.0m.

This disastrous earthquake was felt over the whole of Chile, "between Antofagasta (lat. -23°) in the north and Valdivia (lat. -40°) more than a thousand miles to the south of it." (London *Times* of Nov. 13). "The town of Coquimbo (30°S. 71°5W.) was partly destroyed by a seismic wave and by fires. Great loss of life and property is reported from Copiapo (27°5S. 71°0W.)." "The earthquake was felt at Buenos Aires (34°5S. 58°5E.), where it was violent enough to extinguish lights and stop clocks." "At Hilo in Hawaii (20°N. 160°W.) a seismic wave washed away many boats." For some days the newspapers continued to give sensational details of this and the following associated shocks:—

Continued on next page.

1800 killed, 35,000 homeless, and so on. The Carnegie Institution commissioned Professor Bailly Willis to investigate the details, and on 1923 June 12 some account was given of his results. He assigned the origin as "near the solitary islands of St. Felix and St. Ambrose, about 670 miles off the coast of Caldera." Lobsters which used to be abundant near St. Felix had been nearly all killed, and only a few young seabirds were found to have survived.

But it seems highly improbable that the origin was so far west as this (say $26^{\circ} \cdot 5S$, $80^{\circ} \cdot 0W$). An epicentre $26^{\circ} \cdot 0S$, $80^{\circ} \cdot 0W$ was adopted on 1917 Feb. 15 and 1918 Sept. 28, so that comparison is easily made. We can only infer that the macroseismic evidence does not help us, and unfortunately the information from the South American stations (except La Paz and Rio de Janeiro) is curiously vague and unsatisfactory just when it might have been expected to be at its best.

The following points may be specially noted, in view of the great importance of this earthquake:—

Time of T_0 . The S and P residuals enable us to calculate the error of T_0 in the manner often previously described. The values assigned for δT_0 are

Values	-25s.	-15s.	-5s.		+5s.	+15s.	+25s.	+35s.
No. Obs.	3	3	6		7	2	3	

The actual mean is $\delta T_0 = +3s.$, which accords well with this distribution.

Time at Antipodes. The values of [P] near the Antipodes are distinctly positive, as given above. Collecting those for $\Delta > 140^{\circ}$ in order of magnitude, we have

Value	-5s.	0s.	+5s.	+10s.	+15s.	+20s.
No. Obs.	2	6	4	4	2	

The actual mean is $+8s.$, which accords well with the distributions shewn. Dividing the 18 observations into groups according to Δ , the mean values are

$\Delta =$	145°	155°	165°
Mean	$+4 \cdot 5s.$	$+8s.$	$+9s.$

So that the corrections indicated to the adopted formula are small. If we increase T_0 by 3s. or 4s., as above, the mean value of the [P] residual is about $[+5s]$, indicating a focal depth slightly *above* normal, say $\cdot 020$ at most.

Depth of focus. It is not easy to test whether this suggestion of a high focus is supported by the observations near the epicentre, for they cluster near a particular azimuth. Excluding for a moment stations for which $\Delta > 89^{\circ}$ (where the errors of the tables are sensible) no less than 23 stations have azimuths between 321° and 373° ; the remaining stations being

	Δ °	Az.	P. s.	S. s.
Rio de Janeiro	25·7	83	-15	-10
Johannesburg	84·8	117	+1	-11
Cape Town	73·9	120	+13	+17
Christchurch	87·0	220	-17	-17

These observations suggest rather accidental errors (or errors possibly in time determination) than errors in epicentre or depth of focus.

As regards the stations with $\Delta > 89^{\circ}$, especially the European ones, the large negative residuals resemble those noticed elsewhere as being probably due to the adopted tables, and we may get useful information on such points from this earthquake. The available results may be summarised thus:—

Corrections to tables for $\Delta > 90^{\circ}$.

Δ °	No. Obs.	P. s.	S. s.
91·8	4	-5	-20
96·8	4	-17	-50
101·1	6	-15	-61
104·7	11	-19	-75
105·6	3	-38	-91
108·7	3	-17	+54

The discontinuity at $\Delta = 106^{\circ}$ suggests that more than one phenomenon is liable to be recorded as S, as already noticed in the "Large Earthquakes of 1913." There is also apparently a discontinuity about $\Delta = 92^{\circ}$, possibly due to the same cause. A number of facts could be explained if there is some phenomenon which occurs about 30s. - 90s., before S and is therefore liable to be mistaken for it, especially if this phenomenon occurs sometimes and not always.

1922. Nov. 11d. 18h. 9m. 12s. Epicentre 29°OS. 71°OW.

(as at 4h.).

A = +.285, B = -.827, C = -.485; D = -.946, E = -.326;

G = -.158, H = +.458, K = -.875.

The identity of the focus with that at 4h. is well supported by direct comparison of the observations near the epicentre, except those at Rio de Janeiro. But it is curious that the European observations show P' some 20 sec. later, and S some 20 sec. earlier than at 4h.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		°	°	m. s.	s	m. s.	s.	m.	m.
Andalgala	N.	4.4	73	0 18	-50	—	—	0.4	2.1
Mendoza		4.5	150	4 36	?	—	—	5.5	7.0
Pilar		6.7	115	2 12	+30	(3 0)	- 2	3.0	6.7
La Quiaca	N.	8.4	36	2 0	- 7	—	—	4.3	6.0
Cipolletti		10.3	167	2 48	+14	—	—	4.9	8.8
Chacarita		12.0	121	2 54	- 5	—	—	6.9	7.2
La Paz		12.8	13	i 3 17	+ 7	i 5 21	-18	6.6	7.4
Rio de Janeiro		25.7	83	e 5 48	- 3	10 24	+ 8	13.2	16.6
Vera Cruz		54.0	331	9 8	-25	—	—	—	—
Tacubaya	E.	55.5	328	9 45	+ 2	17 21	- 7	25.2	30.1
	N.	55.5	328	9 44	+ 1	16 20	-68	25.3	30.0
Georgetown	E.	68.2	355	e 11 9	+ 4	i 20 4	0	e 41.1	—
	N.	68.2	355	i 11 11	- 6	e 20 3	- 1	e 41.2	—
Washington		68.2	355	11 8	- 3	19 59	- 5	e 37.8	—
Ithaca		71.7	356	—	—	—	—	38.8	—
Ann Arbor		72.3	351	11 36	+ 4	20 42	-12	e 34.8	—
Chicago		72.5	348	i 11 33	0	20 38	-18	34.4	—
Toronto		73.0	354	11 48	+12	20 6	-56	30.3	51.4
Cape Town		73.9	120	21 34	?S	(21 34)	+21	—	40.8
Ottawa		74.5	357	11 46	0	21 10	-10	e 35.3	—
Lick	E.	81.6	321	e 12 44	+16	22 42	0	i 40.3	45.0
	N.	81.6	321	e 12 42	+14	22 38	- 4	—	—
Berkeley	E.	82.7	321	—	—	e 22 52	- 2	e 42.8	—
Johannesburg		84.8	117	—	—	—	—	44.8	—
San Fernando		89.3	46	13 36	+24	24 6	0	—	55.5
Coimbra	E.	90.4	42	e 12 31	-47	22 35	-103	40.5	52.5
	N.	90.4	42	—	—	—	—	41.3	52.7
Victoria		90.5	329	23 33	?S	(23 33)	-46	47.2	51.2
	E.	90.5	329	13 17	- 2	24 7	-12	40.5	50.7
Granada		91.4	47	13 23	0	e 24 20	- 8	e 37.8	50.8
Toledo		92.8	45	13 21	-10	24 1	-42	e 37.8	55.8
Algiers		95.6	50	e 13 40	- 7	24 15	-57	42.8	56.8
Tortosa	N.	96.2	46	12 52	-58	24 21	-57	37.7	58.4
Bidston		101.2	35	—	—	25 48	-19	—	54.8
Oxford		101.4	37	—	—	24 40	-89	44.2	61.1
Kew		101.5	37	—	—	—	—	—	66.8
Paris		101.6	40	—	—	e 24 35	-96	47.8	59.8
Stonyhurst		101.7	35	e 18 12	?PR ₁	24 48	-84	—	60.8
Eskdalemuir		102.1	32	e 14 16	- 5	e 24 46	-90	43.8	46.3
Edinburgh		102.5	32	—	—	24 0	-140	44.8	55.8
Besançon		102.8	42	—	—	—	—	51.8	—
Uccle		103.6	39	e 14 24	- 4	e 24 54	-95	e 44.8	60.1
Dyce	N.	103.7	30	—	—	i 24 58	-92	39.9	46.9
Strasbourg		104.5	42	14 27	5	—	—	48.8	62.8
Rocca di Papa		104.5	50	e 24 48	?S	(e 24 48)	-110	e 52.3	65.2
Florence		104.5	47	25 18	?S	(25 18)	-80	43.3	62.8
De Bilt		104.7	39	14 28	- 5	e 25 11	-88	e 44.8	61.2
Melbourne		105.2	209	—	—	25 48	-56	47.5	58.4
Sydney		105.5	215	25 18	?S	(25 18)	-89	52.0	56.7
Innsbruck		106.1	43	—	—	—	—	e 55.8	—
Hamburg		108.0	38	—	—	—	—	e 53.8	60.8
Vienna		109.6	44	14 4	-51	—	—	e 55.8	69.8
Adelaide		110.2	206	—	—	e 29 36	+126	e 57.6	59.8
Helwan		113.8	69	e 19 51	?PR ₁	29 36	+96	64.8	66.0
Tiflis		127.1	57	21 34	?PR ₁	—	—	e 42.5	75.4
Colombo		144.7	122	20 48	[+60]	—	—	—	86.8
Batavia		144.7	174	20 2	[+14]	—	—	—	—
Kodaikanal		145.0	117	72 54	?L	—	—	79.8	88.0
Manila		161.8	220	20 16	[+ 7]	—	—	—	—
Zi-ka-wei		169.3	285	e 23 44	?PR ₁	—	—	e 87.8	—

For Notes see next page.

NOTES TO NOV. 11d. 18h. 9m. 12s.

Additional readings and notes: Ithaca L = +41.8m. and +44.8m. Toronto eL = +48.1m. and +62.7m. Ottawa L = +43.8m. and +48.1m., T₀ = 18h.9m.33s. Berkeley eLE = +53.9m. and +58.9m., eLN = +44.7m., and +51.6m. Coimbra PS = +23m.23s., iN = +23m.48s., T₀ = 18h.9m.38s. Victoria (first line) S = +32m.18s., the second line is composed of M-S readings. Paris MN = +52.8m. Eskdalemuir e = +18m.27s., iE = +24m.58s., e = +27m.17s., SR₁? = +33m.16s., MN = 46.5m. Uccle PR₁ = +18m.36s., MN = +63.2m. Strasbourg MN = +61.2m. Rocca di Papa eS = +32m.12s. De Bilt PR₁ = +18m.45s., e = +28m.1s., MNZ = +58.9m. Vienna iZ = +19m.3s. Adelaide gives four other "e" readings. Tiflis e = +22m.16s. and +28m.3s., MN = +91.6m. Manila P is increased by 10m., also e = +20m.48s.

Nov. 11d. 22h. 13m. 0s. Epicentre 37°-5N. 23°-0E. (as on 1922 Aug. 19d.).

A = +730, B = +310, C = +609; D = +391, E = -921;
G = +560, H = +238, K = -793.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.		m. s.	s.	m.	m.
Athens	0.7	51	i 0 34	+23	—	—	—	0.8
Pompeii	7.3	299	1 51	0	2 31	-47	—	—
Belgrade	7.5	347	i 1 57	+ 3	i 3 56	?L	(i 3.9)	4.9
Rocca di Papa	9.0	58	i 2 15	- 1	i 3 56	- 7	—	5.5
Florence	10.9	309	5 0	?L	—	—	(5.0)	7.0
Vienna	11.5	338	i 2 53	+ 1	i 5 29	+22	—	8.1
Innsbruck	13.0	323	i 5 10	?S	(i 5 10)	-34	(i 7.4)	—
Moncalieri	13.7	308	1 44	-98	6 4	+ 3	8.0	—
Zurich	14.5	318	e 3 27	- 6	i 6 11	- 9	—	—
Strasbourg	15.6	320	3 48	+ 1	e 8 27	?L	9.4	—
Besançon	15.8	313	e 3 49	0	—	—	—	—
Algiers	15.9	273	e 3 43	- 8	6 51	- 2	—	—
Tortosa	17.7	286	4 11	- 2	7 36	+ 3	e 20.0	—
Hamburg	18.5	335	e 4 19	- 4	—	—	—	—
Uccle	18.8	321	4 25	- 2	e 7 48	-10	e 10.0	—
De Bilt	19.2	325	4 31	0	8 6	0	9.8	—
Granada	21.1	277	4 55	+ 1	i 8 43	- 3	—	—
Toledo	21.2	285	e 4 53	- 2	8 57	+ 9	—	—
Coimbra	24.5	286	e 4 50	-43	9 23	-31	e 18.0	—
Eskdalemuir	25.1	324	—	—	i 9 55	-10	—	—
Edinburgh	25.4	325	—	—	—	—	—	10.0

Vienna gives also i = +4m.7s.

Nov. 11d. 23h. 26m. 0s. Epicentre 29°-0S. 71°-0W. (as at 18h.).

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.		m. s.	s.	m.	m.
Andalgala	E.	4.4	73	0 36	-32	—	1.7	2.0
	N.	4.4	73	0 30	-38	—	1.5	1.6
Pilar	E.	6.7	115	1 12	-30	—	3.9	4.7
La Quiaca	E.	8.4	36	1 24	-43	—	3.5	4.3
	N.	8.4	36	2 0	- 7	—	4.1	4.8
Cipolletti		10.3	167	2 48	+14	—	5.2	7.2
La Paz		12.8	13	e 3 27	+17	5 33	- 6	6.4
Coimbra		90.4	42	e 40 32	?	—	e 51.0	—
Toledo		92.8	45	—	—	—	52.0	—
Tortosa	N.	96.2	46	—	—	—	e 52.0	57.4
Stonyhurst		101.7	35	e 49 0	?L	—	(e 49.0)	61.0
Eskdalemuir		102.1	32	e 46 0	?	—	60.0	—
Edinburgh		102.5	32	—	—	—	e 55.5	—
Uccle		103.6	39	—	—	—	e 51.0	—
Strasbourg		104.5	42	—	—	—	e 60.4	—
De Bilt		104.7	39	—	—	—	e 52.0	—
Colombo		144.7	122	85 0	?L	—	(85.0)	92.0

Coimbra gives also e = +46m.22s., eLN = +52.0m.

Nov. 11d. Readings also at 1h. (near Tokyo), 2h. (La Paz), 5h. (Mendoza and near Mizusawa), 6h. (Florence), 7h. (Washington, Granada, Toledo, La Quiaca, and Batavia), 8h. (Hamburg), 9h. (Azores), 10h. (Pilar (2), La Quiaca, Mendoza (2), and Cipolletti (2)), 11h. (Eskdalemuir, De Bilt, Uccle, Strasbourg, La Quiaca (2), Pilar (2), Cipolletti (2), and Mendoza), 12h. (Tortosa), 16h. (near Tokyo and near Mizusawa), 17h. (Batavia, Pilar, Mendoza, and Vienna), 20h. (La Paz), 21h. (La Paz), 22h. (La Paz). See also Appendix.

Nov. 12d. 7h. 9m. 0s. Epicentre $29^{\circ}\text{S. } 71^{\circ}\text{W.}$ (as on 11d. 4h., 18h., and 23h.)

A = +.285, B = -.827, C = -.485; D = -.946, E = -.326;
G = -.158, H = +.458, K = -.875.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Andalgala	E.	4.4	73	-0 30	?	—	—	0.6	1.7
	N.	4.4	73	-0 24	?	—	—	0.8	1.5
Mendoza		4.5	150	4 54	?	—	—	6.0	7.4
Pilar	E.	6.7	115	1 42	0	—	—	3.8	5.1
	N.	6.7	115	1 48	+ 6	—	—	3.9	4.5
La Quiaca		8.4	36	—	—	—	—	5.0	5.8
Cipolletti		10.3	167	2 36	+ 2	—	—	3.9	4.2
Chacarita	E.	12.0	121	5 30	?S	(5 30)	+11	6.6	8.1
	N.	12.0	121	5 12	?S	(5 12)	- 7	6.6	7.9
La Paz		12.8	13	—	—	5 39	0	7.0	7.8
Rio de Janeiro		25.7	83	16 48	+63	11 42	+86	17.0	18.3
Tacubaya	E.	55.5	328	9 46	+ 3	17 24	- 4	—	—
Toronto		73.0	354	—	—	—	—	55.0	—
Ottawa		74.5	357	—	—	i 21 22	+ 2	—	—
Coimbra		90.4	42	10 13	?	23 20	-58	51.0	—
Victoria		90.5	329	23 54	?S	(23 54)	-25	45.9	51.1
Algiers		95.6	50	e 16 43	?	24 10	-62	—	51.5
Tortosa	N.	96.2	46	—	—	—	—	e 45.0	60.2
Bidston		101.2	35	—	—	54 0	?L	(54.0)	90.0
Oxford		101.4	37	—	—	i 24 40	-89	47.4	60.2
Kew		101.5	37	—	—	—	—	—	66.0
Stonyhurst		101.7	35	e 44 30	?L	—	—	(e 44.5)	62.0
Edinburgh		102.5	32	—	—	—	—	e 57.0	67.0
Moncalieri		102.8	45	e 15 32	-68	25 49	-33	54.6	62.9
Uccle		103.6	39	—	—	e 24 54	-95	e 47.0	67.0
Florence		104.5	47	e 39 0	?	—	—	—	59.0
Strasbourg		104.5	42	—	—	—	—	e 64.7	—
Rocca di Papa		104.5	50	—	—	—	—	52.8	83.0
De Bilt		104.7	39	—	—	e 25 36	- 63	e 51.0	66.5
Hamburg		108.0	38	—	—	—	—	e 58.0	—
Vienna	z.	109.6	44	e 19 10	?PR ₁	—	—	—	—
Colombo		144.7	122	72 0	?L	—	—	(72.0)	90.0
Kodaikanal		145.0	117	79 0	?L	—	—	(79.0)	—

Additional readings: Tacubaya gives also PN = +9m.42s. Victoria S = +30m.24s. (?SR₁). Moncalieri MN = -62.6m. De Bilt MN = -62.2m., MZ = +65.8m.

Nov. 12d. Readings also at 0h. (La Paz), 1h. (Pilar, Cipolletti, La Paz, and Mendoza), 4h. (La Paz), 5h. (La Paz and Apia), 9h. and 10h. (3) (near Athens), 13h. (Pilar, Andalgala, and Mendoza), 16h. (near Mizusawa, near Tacubaya, and near Tokyo (5)), 17h. (near La Paz and Mendoza, and near Tokyo (4)), 18h. (La Paz (2)), 19h. (Colombo), 22h. (Florence). See also Appendix.

Nov. 13d. 3h. 56m. 0s. Epicentre $65^{\circ}\text{N. } 19^{\circ}\text{W.}$

A = +.391, B = -.138, C = +.910; D = -.334, E = -.943;
G = +.858, H = -.304, K = -.415.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Edinburgh		12.4	133	—	—	—	—	6.0	14.3
Esksdalenmuir		12.9	134	e 4 0	+48	e 6 20	?L	(e 6.3)	—
Stonyhurst		14.4	136	i 7 30	?L	—	—	(i 7.5)	8.2
Bidston		14.6	138	5 29	?S	(5 29)	-53	8.8	10.5
Oxford		16.5	137	4 21	+22	i 7 13	- 6	i 8.9	11.9
Kew		17.1	136	—	—	—	—	—	10.0
Upsala		17.6	91	e 4 14	+ 2	7 34	- 3	—	—
De Bilt		18.2	125	4 20	+ 1	7 45	+ 1	9.6	—
Hamburg		18.8	115	e 4 21	- 6	i 7 54	- 4	—	—
Uccle		19.1	129	4 30	0	—	—	e 9.0	—
Moncalieri		25.3	131	5 40	- 1	9 32	-37	13.1	—
Vienna	z.	25.5	115	e 5 58	+15	—	—	—	—
Coimbra		26.1	160	5 23	-26	(10 10)	-14	—	—
Toledo		27.1	153	4 57	-62	11 0	+17	13.8	16.6
Tortosa		27.2	145	6 0	0	e 16 30	?L	(e 16.5)	—

Additional readings: Bidston gives also P = +7m.0s., S = +7m.50s. Coimbra eSN = +18m.20s., eSE = +18m.45s.

Nov. 13d. Readings also at 0h. (La Paz), 1h. (Pilar, Mendoza, Cipolletti, and La Paz), 2h. (La Paz, Pilar, Mendoza, and near Tokyo), 3h. (La Paz and Mendoza), 4h. (La Paz (3), Cipolletti (2), Pilar (3), La Quiaca (2), Mendoza (3), Andalgala (3), Eskdalemuir, Tortosa, Toledo, Uccle, Victoria, Coimbra, and Florence. Some of these readings are given as late phases of the 3h.56m.0s. shock tabulated above), 5h. (De Bilt, Hamburg, Edinburgh, and Colombo), 6h. (La Paz), 7h. (Pilar, Cipolletti, Mendoza, and Andalgala, La Paz (2), Pompeii, and Rocca di Papa), 8h. (La Paz, Cipolletti, Pilar, and Mendoza), 9h. (Colombo and La Paz), 10h. and 17h. (La Paz), 19h. (La Paz, Mendoza, and Pilar), 21h. (La Paz), 22h. (La Paz, Pilar, Mendoza, and Cipolletti). See also Appendix.

Nov. 14d. Readings at 1h. (Mendoza and La Paz), 2h. (Mendoza and La Paz), 5h. (De Bilt, Eskdalemuir, Coimbra, Vienna, Uccle, Toledo, Colombo, Kodaikanal, Johannesburg, Cape Town, La Paz, Mendoza, and Pilar), 6h. (Victoria), 8h. (near La Paz), 15h. (Algiers), 17h. (La Paz), 19h. (Marseilles).

Nov. 15d. Readings at 0h. (Lick), 1h. (Colombo), 2h. (Lick), 6h. (La Paz (2), Mendoza (2), Pilar (2), Cipolletti (2), and Andalgala (2)), 8h. (La Paz, Pilar, Cipolletti, Mendoza, and Andalgala), 11h. (La Paz and near Tokyo and Mizusawa), 13h., 14h. (2), and 18h. (La Paz), 23h. (La Paz and near Mizusawa). See also Appendix.

Nov. 16d. Readings at 0h. (La Paz), 1h. (Lick and La Paz), 2h. (La Paz (2), Mendoza (2), Andalgala, Cipolletti (2), and Pilar), 4h. (Batavia, Mendoza, Andalgala (2), Cipolletti, La Paz (2), and Pilar), 10h. (Manila), 11h. (near Lick and Berkeley), 12h. (Manila), 13h. (Batavia), 17h. (near Tortosa), 21h. (La Paz), 22h. (La Paz and Batavia), 23h. (La Paz). See also Appendix.

1922. Nov. 17d. 11h. 2m. 42s. Epicentre 29°0S. 71°0W.

(as on 1922 Nov. 12d.).

A = +.285, B = -.827, C = -.485; D = -.946, E = -.326;

G = -.158, H = +.458, K = -.875.

		Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Andalgala	E.	4.4	73	-1 36	?	—	—	-0.4	2.1
Pilar	E.	6.7	115	2 0	+18	—	—	4.0	5.5
	N.	6.7	115	1 54	+12	—	—	3.9	5.2
La Quiaca		8.4	36	2 42	+35	—	—	4.3	6.4
Cipolletti		10.3	167	3 36	+62	—	—	7.0	10.3
Chacarita		12.0	121	3 6	+7	5 54	+35	7.2	8.7
La Paz		12.8	13	13 7	-3	15 43	+4	6.9	7.4
Rio de Janeiro		25.7	83	15 42	-3	10 36	+20	13.1	14.3
Balboa Heights	N.	38.9	348	7 38	-7	13 23	-28	—	21.3
Tacubaya	E.	55.5	328	9 51	+8	17 30	+2	26.0?	30.0
	N.	55.5	328	9 52	+9	17 29	+1	26.2	30.1
Georgetown	E.	68.2	355	e 10 20	-45	19 18	-46	—	—
	N.	68.2	355	e 10 20	-45	19 20	-44	e 37.9	—
Washington		68.2	355	11 12	+7	21 12	+68	37.8	—
Ithaca		71.7	356	e 11 35	+7	20 41	-5	33.3	—
Tucson	N.	72.0	325	—	—	—	—	e 36.5	—
Ann Arbor		72.3	351	11 42	+10	20 48	-6	35.2	—
Chicago		72.5	348	11 48	+15	20 48	-8	34.5	—
Toronto		73.0	354	12 18	+42	21 12	+10	30.3	55.0
Northfield		73.2	359	—	—	21 10	+6	43.3	—
Cape Town		73.9	120	21 50	?S	(21 50)	+37	—	39.2
Ottawa		74.5	357	11 55	+9	21 16	-4	e 32.3	—
Lick		81.6	321	e 12 40	+12	i 22 40	-2	i 39.2	44.8
Berkeley		82.7	321	e 12 34	0	e 22 46	-8	e 42.4	—
Johannesburg		84.8	117	23 18	?S	(23 18)	+1	42.3	47.8
San Fernando		89.3	46	13 48?	+36	24 0?	-6	—	73.9
Rio Tinto		89.9	45	27 18	?	—	—	—	61.3

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Victoria	90.5	329	13 38	+19	23 53	-26	40.1	51.0
Granada	91.4	47	e 13 44	+21	i 24 37	+ 9	e 41.3	—
Toledo	N.E. 92.8	45	—	—	—	—	—	57.5
Algiers	95.6	50	e 13 48	+ 1	e 24 18	-54	42.3	60.3
Tortosa	N. 96.2	46	—	—	25 9	- 9	37.6	59.4
Barcelona	97.5	46	—	—	e 24 14	-77	e 42.2	56.4
Honolulu	E. 97.8	290	24 26	?	32 8	?SR ₁	44.6	46.3
	N. 97.8	290	i 24 36	?	—	—	41.2	46.3
Marseilles	100.5	46	—	—	e 25 18	-43	e 36.3	58.3
Bidston	101.2	35	17 21	?PR ₁	25 53	-14	—	57.8
Oxford	101.4	37	—	—	24 58	-71	40.7	61.1
Kew	101.5	37	—	—	—	—	—	63.3
Paris	101.6	40	—	—	i 25 4	-67	48.3	55.3
Sitka	101.6	330	—	—	—	—	56.3	58.3
Stonyhurst	101.7	35	—	—	—	—	—	57.8
Eskdalemuir	102.1	32	—	—	i 25 54	-22	44.3	46.6
Edinburgh	102.5	32	—	—	e 25 6	-74	46.3	66.3
Moncalieri	102.8	45	13 48	-36	25 8	-74	41.2	64.7
Besançon	102.8	42	—	—	25 16	-66	47.3	—
Uccle	103.6	39	—	—	e 25 18	-71	e 45.3	52.1
Dyce	N. 103.7	30	—	—	i 25 12	-78	44.4	57.0
Florence	104.5	47	22 28	?PR ₁	—	—	—	48.8
Rocca di Papa	104.5	50	e 18 42	?PR ₁	i 26 30	- 8	e 52.5	72.4
Strasbourg	104.5	42	e 16 48?	+136	e 25 33	-65	45.9	63.0
De Bilt	104.7	39	—	—	e 26 16	-23	e 44.3	53.0
Melbourne	105.2	209	—	—	e 26 42	- 2	50.8	57.7
Innsbruck	106.1	43	—	—	—	—	e 48.3	—
Hamburg	108.0	38	—	—	—	—	e 52.3	61.3
Bergen	108.6	30	—	—	—	—	67.3	—
Vienna	109.6	44	e 0 34	?	—	—	e 48.3	64.3
Belgrade	110.9	49	—	—	—	—	e 60.0	—
Helwan	113.8	69	19 58	?PR ₁	29 41	+101	—	72.8
Königsberg	114.2	39	—	—	e 26 6	-118	e 56.3	65.8
Malabar	143.7	177	i 20 4	[+18]	—	—	—	—
Colombo	144.7	122	—	—	—	—	74.8	94.8
Batavia	144.7	174	i 19 44	[- 4]	—	—	e 73.5	—
Kodaikanal	145.0	117	29 36	?S	—	—	77.6	86.9
Mizusawa	E. 151.7	300	20 17	[+19]	20 36	?	—	—
Simla	N. 152.5	78	—	—	e 33 30	?	—	—
Manila	161.8	220	e 20 18	[+ 9]	—	—	—	—
Zi-ka-wei	169.3	285	e 20 31	[+17]	e 39 25	?	—	80.4

Additional readings and notes: Rio de Janeiro gives its readings as at 10h.,
 $T_0 = 10h.2m.9s.$ Ithaca gives also $PR_1 = +14m.46s.$, $L = +41.3m.$, and
 $+52.3m.$ Toronto $L = +46.8m.$ and $+49.9m.$ Ottawa $L = +34.3m.$,
 $T_0 = 11h.3m.15s.$ Azores ($\Delta = 79^\circ.0$) gives $P = 11h.1m.12s.$ Lick
 $ePN = +12m.51s.$ Berkeley gives several other L readings. San Fer-
nando $MN = +58.5m.$ Granada $i = +15m.17s.$ Algiers $MN = +50.3m.$
Oxford $ePR_1 = +18m.24s.$ Honolulu $LN = +44.2m.$ and $+45.4m.$ Bid-
ston $P = +19m.33s.$, $S = +26m.49s.$ Paris $MN = +69.3m.$ Sitka
 $e = +51m.26s.$, $eE = +54m.16s.$, $LN = +56.2m.$, $MN = +60.1m.$ Esk-
dalemuir $e(?)S = +24m.59s.$, $?SR_1 = +33m.18s.$ Melbourne $eS =$
 $+25m.12s.$, $eSR_1 = +33m.12s.$, $iSR_1 = +34m.18s.$ Moncalieri $MN =$
 $+51.8m.$ Uccle $MN = +63.8m.$ Dyce $i = +33m.16s.$ Rocca di Papa
 $ePE = +19m.4s.$, $ePN = +19m.6s.$, $ePV = +19m.30s.$, $eLN = +32.7m.$
Strasbourg $MN = +66.6m.$ De Bilt $ePR_1Z = +18m.54s.$, $MNZ = +63.8m.$
Hamburg $MN = +69.3m.$ Bergen $e = +55m.18s.$ Belgrade $L =$
 $+66.9m.$, and $+70.0m.$ Königsberg $MN = +65.3m.$, S has been increased
by 1h. Batavia $i = +20m.19s.$, $iN = +20m.51s.$, $eL = +92.4m.$
Zi-ka-wei $PR_1Z = +25m.31s.$

Nov. 17d. Readings also at 1h. (La Paz), 3h. (Granada), 6h. (La Paz), 8h. (near
Belgrade), 9h., 12h., and 13h. (La Paz), 17h. (near Oaxaca and Tacubaya),
18h. (near Tacubaya), 19h. (La Paz, Pilar, and Mendoza), 21h. (Manila).

Nov. 18d. 18h. 56m. 24s. Epicentre $24^{\circ}0'N$. $120^{\circ}0'E$. (as on 1922 Sept. 4d.).

A = -457, B = +792, C = +407 ; D = +866, E = +500 ;

G = -204, H = +352, K = -914.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Taihoku	1.8	53	0 28	0	—	—	0.6	0.7
Hong Kong	5.6	254	—	—	—	—	—	5.1
Zi-ka-wei	7.3	10	e 1 49	- 2	e 3 15	- 3	—	4.0
Manila	9.5	172	e 3 36	?S	(e 3 36)	-40	8.9	—
Hamburg	81.9	328	—	—	—	—	e 44.6	—
De Bilt	85.2	326	—	—	—	—	e 44.6	49.6
Strasbourg	85.7	322	—	—	—	—	e 48.8	—
Edinburgh	86.8	332	—	—	—	—	47.6	—
Eskdalemuir	87.2	332	—	—	e 36 46	?	43.6	48.6
Stonyhurst	87.8	330	—	—	—	—	—	51.6
Kew	88.2	329	—	—	—	—	—	51.6
Paris	88.4	326	—	—	—	—	47.6	—
Oxford	88.6	329	—	—	—	—	45.4	49.7
Algiers	95.1	315	—	—	—	—	e 47.6	48.6

Additional readings and notes: Zi-ka-wei gives also MN = +4.2m., MZ = +5.3m. De Bilt MN = +49.5m. Algiers readings have been increased by 1h.

Nov. 18d. Readings also at 2h. (near Batavia), 3h. (La Paz), 6h. (Algiers), 8h. (La Paz), 9h. (Pompeii and Rocca di Papa), 10h. (near Colima), 11h. (Tiflis), 13h. (La Paz), 14h. (near Tacubaya), 16h. and 22h. (La Paz), 23h. (near Tokyo).

Nov. 19d. 17h. 4m. 26s. Epicentre $36^{\circ}5'N$. $1^{\circ}5'E$. (as on 1922 August 25d.).

A = +804, B = +021, C = +595 ; D = +026, E = -1.000 ;

G = +595, H = +016, K = -804.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Algiers	1.3	76	0 30	+10	0 56	+20	—	1.3
Granada	4.1	280	i 1 3	- 1	i 1 53	0	i 2.0	2.1
Tortosa	4.4	351	1 8	0	2 0	- 1	2.3	5.9
Barcelona	5.0	6	—	—	—	—	e 2.8	3.7
Toledo	5.5	310	1 31	+ 6	2 24	- 7	2.7	3.1
Moncalieri	9.7	28	e 1 36	-50	—	—	5.0	—
Uccle	14.5	8	—	—	—	—	e 6.6	—
De Bilt	15.8	8	—	—	—	—	e 8.6	—
Eskdalemuir	19.1	352	—	—	—	—	9.6	—
La Paz	84.3	245	53 3	?L	—	—	(53.0)	—

Toledo gives also MNW = +3.4m.

Nov. 19d. Readings also at 2h. (Coimbra), 5h. (Zi-ka-wei), 7h. (Batavia and Manila), 8h. (Zi-ka-wei), 9h. (Porto Rico), 10h. (Vera Cruz), 11h. (Vienna, and near Tacubaya), 12h. (Hong Kong and Zi-ka-wei), 13h. (Azores and De Bilt), 15h. and 19h. (La Paz), 23h. (Granada).

Nov. 20d. 4h. 24m. 44s. Epicentre $37^{\circ}5'N$. $29^{\circ}0'E$. (as on 1920 July 4d.).

A = +694, B = +385, C = +609 ; D = +485, E = -875 ;

G = +533, H = +295, K = -793.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Athens	4.2	277	e 1 4	- 1	1 53	- 2	2.0	2.2
Pompeii	11.7	291	e 6 21	?L	—	—	(e 6.4)	—
Uccle	22.0	315	e 5 8	+ 3	—	—	e 12.3	—
De Bilt	22.2	319	—	—	e 9 16	+ 7	e 12.9	—
Eskdalemuir	28.1	320	—	—	—	—	15.3	—

Athens gives also MN = +2.7m.

Nov. 20d. 15h. 29m. 20s. Epicentre $8^{\circ}0'N$, $37^{\circ}5'W$. (as on 1915 Sept. 12d.).

$A = +.786$, $B = -.603$, $C = +.139$; $D = -.609$, $E = -.793$;

$G = +.111$, $H = -.085$, $K = -.990$.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
La Paz		39.0	231	7 39	- 7	—	—	19.6	22.6
La Quiaca	E.	40.9	222	22 34	?L	—	—	24.5	26.2
Pilar	E.	47.0	211	23 10	?L	—	—	26.9	28.5
	N.	47.0	211	22 58	?L	—	—	27.5	28.2
Mendoza		50.3	216	27 40	?L	—	—	31.5	32.0
Bidston		53.2	25	28 15	?L	—	—	(28.2)	30.8
Besançon		53.9	39	—	—	—	—	26.7	—
Eskdalemuir		54.5	23	e 12 40	? e 17 40	—	- 25	24.7	—
Uccle		55.0	32	—	—	—	—	e 23.7	—
Edinburgh		55.0	23	—	—	—	—	e 24.7	—
Strasbourg		55.6	36	—	—	e 25 40	?L	29.7	—
De Bilt		56.1	31	—	—	e 17 47	+ 12	27.7	—

La Paz gives also $MN = -21.5m$.

Nov. 20d. Readings also at 1h. (near Mizusawa and Tokyo), 6h. and 11h. (La Paz), 12h. (Rocca di Papa and Pompeii), 14h. (near Mizusawa), 21h. (Melbourne, La Paz, Mendoza, La Quiaca, Cipolletti, Chacarita, Andalgalá, and Pilar), 22h. (Eskdalemuir, De Bilt, and near Puebla, Uccle, Vera Cruz, Tacubaya, Colima, and Oaxaca). See also Appendix.

Nov. 21d. Readings at 0h. (Batavia), 3h. (La Paz, Chacarita, Andalgalá, Mendoza, Pilar, and Cipolletti), 4h. (De Bilt, Sydney, Uccle, and Eskdalemuir), 8h. (Rocca di Papa), 11h. (Azores), 13h. (Honolulu), 15h. (Tacubaya), 17h. (Cape Town), 21h. (Tiflis) and near Mizusawa). See also Appendix.

Nov. 22d. Readings at 3h. (La Paz and near Tokyo), 5h. (Batavia), 14h. (Apia, De Bilt, Sydney, and near Mizusawa), 15h. (Vienna, Granada, Honolulu, Victoria, and Ottawa), 16h. (De Bilt), 19h. (near La Paz).

Nov. 23d. Readings at 0h. (Zi-ka-wei), 2h. (near Manila), 9h. and 11h. (La Paz), 12h. (near Algiers), 14h. (Simla), 18h. (La Paz).

Nov. 24d. 2h. 15m. 40s. Epicentre $45^{\circ}5'N$, $19^{\circ}0'E$.

$A = -.663$, $B = -.228$, $C = -.713$; $D = -.326$, $E = -.946$;

$G = -.674$, $H = +.232$, $K = -.701$.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Belgrade		1.2	124	i 2 28	- 130	i 2 48	- 135	—	2.9
Mostar		2.3	202	i 2 55	- 139	—	—	—	4.0
Sini		2.4	208	i 2 49	- 132	3 33	- 147	—	3.9
Vienna		3.3	327	i 0 53	- 1	1 49	- 18	—	2.0
Pompeii		5.7	216	e 4 11	?L	—	—	(e 4.2)	5.0
Florence		5.7	255	e 1 59	- 31	—	—	—	3.6
Rocca di Papa	E.	5.9	233	e 1 40	- 9	2 50	- 9	—	—
	N.	5.9	233	e 1 32	- 1	2 56	- 15	—	—
Zurich		7.4	289	e 1 48	- 4	i 3 26	- 5	i 3.9	4.2
Moncalieri		7.9	270	1 54	- 6	3 42	- 8	4.8	5.3
Strasbourg		8.3	296	e 2 54	- 48	e 4 25	- 10	e 4.7	5.5
Besançon		9.1	286	2 59?	- 41	—	—	—	—
Hamburg		10.0	328	—	—	—	—	e 5.3	—
Uccle		11.4	304	e 4 50	?8	(e 4 50)	- 7	(e 6.0)	—
De Bilt		11.2	311	—	—	—	—	e 6.2	7.6
Coimbra		20.7	265	—	—	—	—	e 13.0	—

Additional readings: Belgrade gives also $MN = +3.0m$. Vienna $P = +1m.8s$, $PR_2 = +1m.34s$. Rocca di Papa $PR_1N = +1m.56s$, $PR_1E = +2m.2s$. Zurich $eE = +1m.51s$. Strasbourg $eP = +2m.56s$, $eS = +4m.26s$, $MN = +5.1m$. Coimbra $e = +12m.20s$.

Nov. 24d. Readings also at 0h. (La Paz (2) and Algiers), 5h. (Manila), 6h. (Algiers (2)), 8h. (Algiers), 10h. (La Paz).

Nov. 25d. Readings at 9h. (Colombo and near Tokyo), 10h. (Lick), 13h. (Taihoku), 14h. (Azores), 16h. (Manila), 17h. (La Paz), 18h. (Paris and near Tortosa), 20h. (La Paz).

Nov. 26d. 13h. 30m. 0s. Epicentre 29° -0S. 71° -0W. (as on Nov. 17d.).

A = +.285, B = -.827, C = -.485; D = -.946, E = -.326;
G = -.158, H = +.458, K = -.875.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Andalgala		4.4	73	5 24	?	—	—	6.5	7.3
Mendoza		4.5	150	—	—	—	—	2.8	4.8
Pilar	E.	6.7	115	1 12	-30	(2 48)	-14	2.8	3.9
	N.	6.7	115	1 24	-18	(3 0)	-2	3.0	3.7
La Quiaca	E.	8.4	36	2 48	+41	—	—	4.3	5.4
	N.	8.4	36	3 0	+53	—	—	4.3	5.5
Cipolletti		10.3	167	2 12	-22	(4 0)	-37	4.0	5.2
Chacarita	E.	12.0	121	2 42	-17	(5 12)	-7	5.2	6.8
	N.	12.0	121	2 48	-11	(5 36)	+17	5.6	7.7
La Plata	E.	12.6	120	2 59	-8	5 15	-19	6.0	9.5
	N.	12.6	120	2 55	-12	5 16	-18	6.0	7.6
La Paz		12.8	13	i 3 14	+ 4	i 5 40	+ 1	i 6.0	9.2
Washington		68.2	355	11 0	-5	20 20	+16	—	—
Chicago		72.5	348	11 16	-17	20 37	-19	44.0	—
Toronto		73.0	354	—	—	(21 30)	+28	21.5	—
Northfield		73.2	359	—	—	e 20 38	-26	—	—
Coimbra		90.4	42	—	—	—	—	46.0	—
Victoria		90.5	239	23 59	?S	(23 59)	-20	45.0	46.4
Toledo		92.8	45	—	—	—	—	e 37.0	51.0
Algiers		95.6	50	—	—	e 23 41	-91	48.0	87.0
Bidston		101.2	35	—	—	—	—	—	60.0
Oxford		101.4	37	—	—	i 24 20	-109	—	60.0
Edinburgh		102.5	32	—	—	—	—	e 55.0	63.0
Moncalieri		102.8	45	—	—	e 25 15	-67	90.5	—
Uccle		103.6	39	—	—	—	—	—	53.0
Rocca di Papa		104.5	50	e 18 12	?PR ₁	25 54	-44	e 56.6	59.8
De Bilt	E.	104.7	39	—	—	—	—	e 51.0	59.4
	N.	104.7	39	—	—	e 25 52	-47	e 56.0	61.3
Colombo		144.7	122	20 0	[+12]	—	—	—	45.0
Batavia		144.7	174	i 19 35	[-13]	—	—	—	—

La Paz gives also L = +7.1m. and +7.4m. Mendoza readings increased by 10m. Moncalieri e has been diminished by 1h.

Nov. 26d. Readings also at 1h. (La Paz), 2h. (Granada), 3h. (Manila), 8h. (near Berkeley), 13h. (Zi-ka-wei), 14h. (Coimbra, La Paz, Pilar, Chacareta, Cipolletti, Andalgala, Mendoza, and La Quiaca), 20h. (near Lick), 21h. (near Taihoku). See also Appendix.

Nov. 27d. Readings at 10h. (near Batavia), 12h. (La Paz), 14h. (La Paz and near Granada), 17h. (near Rocca di Papa), 20h. and 23h. (La Paz).

Nov. 28d. Readings at 0h. (La Paz), 5h. (Rocca di Papa), 13h. (Taihoku and Zi-ka-wei), 17h. (Lick and La Paz), 21h. (Algiers), 22h. (Zi-ka-wei).

Nov. 29d. Readings at 7h. (Osaka, Zi-ka-wei, Manila, and Nagasaki, also near Tokyo), 10h. (Tiflis and near Tacubaya), 11h. (near Tacubaya (2)), 13h. (Manila), 14h. (La Paz), 15h. (Manila), 16h. (Batavia and La Paz), 17h. (Manila), 18h. (Rio Tinto), 20h. (2) and 21h. (La Paz).

Nov. 30d. Readings at 0h. (Granada), 2h. (near Vera Cruz), 3h. (near Colima), 10h. (La Paz), 11h. (Oaxaca, near Tacubaya, and near Tokyo), 17h. (Manila).

Dec. 1d. Readings at 1h. (near Tacubaya), 2h. (near Tacubaya, Merida, Oaxaca, and Puebla), 6h. (La Paz), 13h. (Azores), 18h. (near Hong Kong), 20h. (Florence), 23h. (Colombo, Batavia, and Sydney).

Dec. 2d. 3h. 46m. 36s. Epicentre $24^{\circ}0'N$. $120^{\circ}0'E$. (as on 1922 Nov. 18d.).

A = -457, B = +792, C = +407 ; D = +866, E = +500 ;
G = -204, H = +352, K = -914.

	Δ	Az.	P.	O-C.	S.	O-C.	L	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Hokoto	0.6	222	1 22	+73	—	—	1.9	2.0
Taihoku	1.8	53	0 6	-22	—	—	0.3	0.9
Hong Kong	5.6	254	1 54	+27	—	—	4.4	5.1
Zi-ka-wei	7.3	10	1 55	+4	e 3 10	-8	—	—
Manila	9.5	172	e 2 42	+19	—	—	—	—
Nagasaki	12.3	42	2 51	-12	—	—	6.0	9.7
Kobe	17.0	47	—	—	—	—	12.0	12.2
Osaka	17.2	48	6 11	+124	—	—	9.4	13.7
Tokyo	20.7	51	e 4 19	-30	e 9 51	+73	e 12.4	12.8
Calcutta	E. 29.1	273	6 34	+15	—	—	18.0	—
	N. 29.1	273	6 37	+18	—	—	17.8	—
Batavia		32.8	205	6 45	-10	—	25.8	—
Simla	E. 38.4	290	7 12	-29	—	—	24.7	—
Colombo		42.1	252	—	—	—	28.4	29.9
Tiflis		63.6	309	—	—	—	e 42.8	—
Bergen		80.6	333	—	—	—	e 40.9	—
Vienna		80.8	320	e 12 29	+5	e 22 45	+12 e 41.4	49.9
Hamburg		81.9	328	—	—	—	e 42.4	52.4
De Bilt		85.2	326	12 50	+1	23 19	-2 e 41.4	49.2
Dyce	N. 85.6	334	—	—	i 23 22	-4	43.4	47.9
Strasbourg		85.7	322	—	—	—	e 45.1	55.4
Rocca di Papa		86.1	314	e 12 54	0	23 30	-1 e 50.5	58.9
Florence		86.1	319	47 11	?L	—	(47.2)	103.5
Uccle		86.3	327	—	—	e 23 24	-9 e 41.4	48.4
Edinburgh		86.8	332	—	—	e 23 24	-15 44.4	48.5
Eskdalemuir E.		87.2	332	—	—	e 23 37	-6 40.4	48.0
Besançon		87.4	322	—	—	—	48.4	—
Moncalieri		87.6	319	8 47	?	23 48	0 48.1	—
Stonyhurst		87.8	330	e 24 12	?S	(e 24 12)	+22	51.9
Kew		88.2	329	—	—	—	—	55.4
Victoria		88.2	37	23 19	?S	(23 19)	-35 48.3	51.8
Bidston		88.4	330	39 10	?L	42 39	?L (42.6)	51.4
Oxford		88.6	329	—	—	i 23 58	-1 43.2	49.7
Barcelona		93.0	320	—	—	—	e 52.3	—
Tortosa	N. 94.3	320	—	—	—	—	51.7	64.0
Toledo		97.6	320	—	—	—	e 45.4	56.4
Coimbra		99.8	323	e 30 24	?	e 41 24	? 54.4	56.6
Ottawa		109.1	12	—	—	—	e 56.9	—
Chicago		109.4	22	—	—	—	e 59.7	—
Toronto		110.0	14	—	—	—	e 65.4	74.6
La Paz		169.3	47	e 20 26	[+12]	—	—	—

Additional readings: Taihoku gives also MN = +5.0m., another set of readings are also given. Kobe MN = +12.6m. Osaka MN = +16.9m. Tokyo MN = +12.6m. Simla PN = +11m.36s., LN = +22.1m. Tiflis e = +48m.12s., e(?L) = +52.3m. Bergen L = +44.6m. Vienna iZ = +13m.59s., iPR₂Z = +15m.41s., ePR₂N = +18m.28s. Hamburg MN = +45.4m. De Bilt PR₂Z = +16m.11s., MZ = +55.7m. Strasbourg MN = +50.8m. Bidston P = +40m.54s. Toledo MNW = +64.4m. Ottawa e = +52m.46s. Chicago eE = +52m.24s. Toronto eL = +74.0m.

Dec. 2d. Readings also at 0h. (Coimbra, Cipolletti, Chacareta, De Bilt, Uccle, La Paz, and Victoria), 1h. (La Paz), 5h. (Kodaikanal), 10h. (La Paz), 18h. (Batavia), 19h. (La Paz), 23h. (Perth).

Dec. 3d. 14h. 42m. 48s. Epicentre $45^{\circ}2N$. $140^{\circ}2E$.

A = -541, B = +451, C = +710 ; D = +640, E = +768 ;
 G = -545, H = +454, K = -705.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Sapporo	2.3	159	—	—	1 0	- 3	1.7	—
Ootomari	2.3	51	0 53	+17	—	—	1.4	1.4
Mizusawa	6.2	173	1 34	- 1	2 45	- 4	—	—
Tokyo	9.6	182	i 2 33	+ 9	i 4 17	- 1	—	5.8
Osaka	11.2	201	2 48	+ 1	(5 2)	+ 3	5.0	6.2
Kobe	11.2	202	e 2 10	-37	(5 1)	+ 2	5.0	5.2
Zi-ka-wei	20.3	233	e 4 45	0	—	—	—	—

Additional readings : Mizusawa gives also $SN = +2m.43s$. P has been increased by 20m. Tokyo MN = +6.2m. Osaka MN = +5.5m. Kobe MN = +5.1m.

Dec. 3d. Readings also at 0h. (Christchurch, De Bilt, and Perth), 1h. (near Vera Cruz and Puebla), 4h. (Apia), 16h. (Zi-ka-wei, Manila, Hong Kong, Almeria, Malaga, and near Granada), 17h. (De Bilt), 19h. (Kong Kong).

Dec. 4d. Readings at 1h. (near Tacubaya, Merida, Colima, Oaxaca, and La Paz, 2h. (De Bilt), 3h. (near Manila), 5h. (Pilar), 6h. (La Paz, Andalgalá, and Cipolletti), 7h. (De Bilt), 13h. (near Mizusawa), 16h. (Tiflis), 22h. (Batavia), 23h. (near Tacubaya (2)).

Dec. 5d. Readings at 4h. (Coimbra), 6h. (Sydney and La Paz), 7h. (Christchurch and Sydney), 8h. (Strasbourg and De Bilt), 12h. (Manila and Zi-ka-wei), 14h. (La Paz).

1922. Dec. 6d. 13h. 55m. 26s. Epicentre $36^{\circ}8N$. $69^{\circ}5E$.

A = +280, B = +750, C = +599 ; D = +937, E = -350 ;
 G = +210, H = +561, K = -801.

A depth 0.020 of focus is assumed. See note at end.

	Corr. for Focus	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Simla	E.	-0.1	8.5	129	2 10	+ 3	—	3.7	—
	N.	-0.1	8.5	129	1 58	- 9	—	3.3	—
Dehra Dun		-0.2	9.6	130	3 4	+42	—	—	—
Bombay		-0.7	18.1	170	4 5	- 5	—	—	—
Tiflis		-0.8	19.7	292	7 40	?S	(7 40)	-20	12.4
Calcutta	E.	-0.9	21.6	126	4 36	-13	(8 8)	-30	8.1
	N.	-0.9	21.6	126	4 38	-11	(8 10)	-28	8.2
Kodaikanal		-1.2	27.5	163	7 4	?PR ₁	(9 34)	-54	9.6
Colombo		-1.5	31.3	162	—	—	—	—	52.7
Helwan		-1.5	32.4	268	i 6 32	- 5	—	—	12.9
Lemberg		-1.6	34.9	306	e 6 58	- 1	e 13 34	+65	14.6
Athens	E.	-1.6	36.1	283	e 7 3	- 6	—	e 14.8	21.2
	N.	-1.6	36.1	283	e 7 4	- 5	—	8.0	16.4
Konigsberg		-1.6	37.1	315	e 7 14	- 4	—	—	8.2
Belgrade		-1.6	37.4	298	i 7 17	- 3	e 10 6	-181	9.3
Vienna		-1.7	39.9	305	e 7 35	- 5	14 40	+59	20.6
Upsala		-1.7	40.0	322	i 7 34	- 6	i 13 33	- 9	19.0
Hong Kong		-1.7	41.0	99	7 21	-28	—	—	18.1
Pompei		-1.8	42.3	291	7 59	0	35 18	?	13.2
Zi-ka-wei		-1.8	42.9	83	i 7 42	-22	e 13 40	-42	—
Innsbruck		-1.8	43.4	302	i 8 4	- 4	e 15 48	+79	—
Rocca di Papa		-1.8	43.5	293	i 8 1	- 8	(e 15 40)	+69	18.8
Hamburg		-1.8	43.7	312	e 8 5	- 5	—	i 21.3	22.2
								—	18.5

Continued on next page.

	Corr. for Focus	Δ	Az.	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Florence	-1.9	44.1	298	8 10	- 2	14 34	- 4	25.6	32.6
Zurich	-1.9	45.3	301	8 17	4				
Strasbourg	-1.9	45.6	305	8 19	- 5	e 15 1	+ 3	e 19.6	19.9
Bergen	-1.9	46.1	321	8 26	- 1	i 16 36	+ 91	18.7	29.5
De Bilt	-2.0	46.3	310	8 29	+ 1	15 14	+ 8		19.8
Moncalieri	-2.0	46.3	300	8 27	-61	i 15 3	- 3	19.2	20.9
Besançon	-2.0	47.0	302	(8 33)	0	(15 34)	+19	15.6	
Uccle	-2.0	47.4	309	8 34	- 2	i 15 21	+ 1	i 16.8	19.7
Marseilles	-2.0	48.3	296	8 55	+13	13 10	+ 1	19.6	
Paris	-2.1	48.9	305	e 8 48	+ 2				20.6
Kew	-2.1	50.1	310						21.6
Dyce	N. -2.1	50.2	318	e 9 0	+ 5	17 20	+85		20.0
Le Mans	-2.1	50.6	305	e 9 4	+ 7	e 17 34	+94	30.6	
Oxford	-2.1	50.7	310	8 58	0	i 16 3	+ 2		
Manila	-2.1	50.8	102	e 8 37	-21				
Stonyhurst	-2.1	50.9	312	9 4	+ 5	16 4	0		21.6
Edinburgh	-2.1	51.0	315	9 0	+ 1	i 17 31	+86		21.3
Eskdalemuir	-2.1	51.1	315	9 2	+ 2	i 16 5	- 1		
Barcelona	-2.1	51.1	296	9 3	+ 3	i 17 40	+94	e 20.4	
Bidston	-2.2	51.4	312	10 4	+63	18 34	+145		22.6
Algiers	-2.2	52.1	290	9 5	- 1	17 48	+90	e 29.6	34.6
Kobe	-2.2	52.2	73	8 57	-10	9 48	?	11.7	13.2
Osaka	-2.2	52.4	73	9 2	- 6	(16 29)	8	16.5	20.5
Tortosa	N. -2.2	52.5	296	9 13	+ 4	16 25	2	21.8	21.8
Otomari	-2.2	53.5	54	9 29	+ 14	(16 22)	- 13	16.4	
Mizusawa	E. -2.3	55.0	65	9 14	-10	9 59	?		
Tokyo	-2.3	55.3	69	e 9 19	/				
Batavia	-2.3	55.3	134	9 30	+ 4	i 18 7	+71		19.9
Toledo	-2.3	56.1	296	9 37	+ 5	18 36	+90	e 29.6	36.8
Granada	-2.3	56.8	292	9 41	+ 5	i 19 3	+108	23.1	29.2
Rio Tinto	-2.4	58.8	295	11 34	+106				21.6
San Fernando	-2.4	59.1	293	9 58	+ 8	19 16	+94		19.6
Coimbra	-2.4	59.1	299	9 59	+ 9	19 12	+90	23.1	25.3
Cape Town	-2.7	85.2	220	12 31	- 2				24.2
Ottawa	-2.8	92.0	336					42.6	
Northfield	-2.8	92.1	334			e 26 34	?SR ₁		
Victoria	-2.9	94.0	8	25 5	?S	(25 5)	+40	35.1	44.8
Toronto	-2.9	94.8	338					39.2	
Ann Arbor	-2.9	97.2	340					53.2	
Washington	-3.0	98.3	334			e 24 54	-15		
Chicago	-3.0	98.7	343	22 37	?	(25 17)	+ 4	44.4	
Sydney	-3.0	103.7	122	19 40	?PR ₁			45.6	48.2
Berkeley	-3.0	104.5	9	e 22 27	?	e 28 31	+141		
Lick	-3.0	105.1	9			i 27 34	+78		
La Paz	-	137.5	286	19 17	[-18]	21 36	?	22.6	23.0

Additional readings: Tiflis gives also $i = +8m.46s.$, $e = +8m.58s.$ Athens
 $iPE = +7m.5s.$, $iPN = +7m.6s.$, $i = +7m.50s.$ Königsberg $iPZ = +7m.16s.$,
 $PR_2NFZ = +9m.56s.$, $PSN = +14m.8s.$, $SR_2N = +16m.8s.$, $SR_1E =$
 $+16m.16s.$, $SR_1Z = +16m.28s.$ Belgrade $i = +8m.0s.$, $SR_1E = +10m.31s.$,
 $SR_1N = +11m.17s.$ Vienna $iPZ = +7m.38s.$, $iZ = +8m.31s.$, $+8m.42s.$,
and $+9m.18s.$, $PR_2?E = +10m.8s.$, $iE = +10m.31s.$, $iN = +10m.33s.$, and
 $+11m.5s.$, $iZ = +10m.44s.$, $SN = +14m.49s.$, $i = +16m.48s.$, $MN = +21.6m.$
Upsala $iE = +10m.17s.$, $iSR_2 = +16m.43s.$ Zi-ka-wei $PSE = +13m.47s.$
Innsbruck $PR_1 = +11m.7s.$ Rocca di Papa $iS = +9m.12s.$ ($?PR_1$), eS
is given as eL . Hamburg $iPE = +8m.6s.$, $PR_2 = +10m.34s.$, $SR_1 =$
 $+18m.4s.$, $MZ = +24.1m.$, $MN = +24.2m.$, $T_0 = 13h.55m.3s.$ Zurich
 $iPN = +8m.18s.$, $i = +11m.27s.$ Epicentre $37^\circ N. 70^\circ E.$ Strasbourg
 $P = +8m.20s.$, $MN = +20.4m.$, $T_0 = 13h.55m.17s.$ Bergen $e = +11m.27s.$,
 $MN = +23.3m.$ De Bilt $iPE = +8m.31s.$, $PR_1 = +10m.26s.$, $e = +18m.53s.$
Moncalieri $MN = +20.2m.$ Besançon gives P as S and S as L . Uccle
 $iP = +11m.34s.$ Marseilles $PR_1 = +10m.9s.$ Paris $MN = +11.6m.$
Dyce $i = +12m.15s.$ and $+16m.55s.$ Oxford $PR_1 = +12m.55s.$, $i =$
 $+17m.24s.$ Eskdalemuir $iE = +10m.11s.$, $iPR_1E? = +11m.4s.$ Bidston
 $S = +11m.9s.$ Kobe $MN = +12.8m.$ Osaka $MN = +19.0m.$ Mizu-
sawa $SN = +10m.1s.$ Toledo $PR_1NW = +12m.57s.$, $PR_1NE = +12m.58s.$,
 $PR_2 = +14m.21s.$, $PR_2NE = +15m.28s.$, $PR_1NW = +15m.38s.$, $SR_1NW =$
 $+24m.28s.$, $SR_1NE = +24m.32s.$, $SR_2NW = +25m.40s.$, $SR_2NE = +25m.44s.$,
 $MNW = +37.2m.$ Granada $i = +14m.34s.$, $T_0 = 13h.53m.43s.$ San
Fernando $MN = +44.0m.$ Coimbra $i = +19m.24s.$, $LN = +24.7m.$, $MN =$
 $+25.2m.$, $T_0 = 13h.54m.11s.$ Ottawa $eLE = +34.6m.$ Victoria $S =$
 $+29m.30s.$ Toronto $L = +58.5m.$ Chicago gives S as PR_1 , also $S?$
 $+31m.34s.$ Berkeley $ePN = +22m.3s.$, $eN = +28m.13s.$ Sydney $L =$
 $+32.3m.$ and $+40.4m.$

The solution is well supported by the Japanese and Indian observatories, and by a number of European observatories, but there are also a number of others which show large S residuals, as follows:—

	s.		s.		s.
Lemberg	+65	Le Mans	+94	Batavia	+71
Vienna	+59	(Oxford)	+79)	Toledo	+90
Innsbruck	+79	Edinburgh	+86	Granada	+108
Rocca di Papa	+69	Barcelona	-94	San Fernando	+94
Bergen	+91	(Bidston)	-85)	Coimbra	+90
Dyce	-85	Algiers	+90		

The Oxford observation is given in the Notes: the Bidston residual has been diminished by 1 minute.

If there was a second shock from the same epicentre following the first by about 85 sec., there ought to be a second P also following at this interval. The following observatories record impulses which might be thus interpreted:—

	s.		s.
Athens	-40	Rocca di Papa	+63
Belgrade	+40	Eskdalemuir	+71
Vienna	+51, +62, +98	Bidston	+68
Upsala	+97		

The Athens readings (in the text) suggest, however, a separate shock near Athens, which may account for some of the additional readings mentioned in the notes.

Dec. 6d. Readings also at 1h. (Mizusawa), 2h. (La Paz), 9h. (near Algiers), 12h. (Innsbruck), 13h. (near Batavia), 14h. (Kobe and La Paz), 15h. (near Granada), 16h. (Florence).

Dec. 7d. 16h. 22m. 10s. (I) { Epicentre $40^{\circ}0'N$, $20^{\circ}0'E$. (as on 1922 Jan. 12d.).
37m. 6s. (II) }

A = +.720, B = +.262, C = +.643; D = +.342, E = -.940;
G = +.604, H = +.220, K = -.766.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Athens	3.6	123	1 32	+36	i 2 33	+54	2.8	3.7
II	3.6	123	1 36	+40	2 35	+56	2.9	3.0
I Mostar	3.7	335	i 0 52	-6	1 15	-27	—	1.6
II	3.7	335	i 0 52	-6	1 23	-19	—	1.6
I Pompeii	4.2	281	1 35	+30	2 40	?L	(2.7)	4.2
II	4.2	281	e 2 19	?S	(e 2 19)	+24	(3.4)	—
I Sinj	4.5	327	i 0 50	-20	i 1 35	-29	—	2.0
II	4.5	327	i 1 14	+4	i 2 4	0	—	2.3
I Belgrade	4.8	4	i 1 9	-5	i 2 13	+2	—	2.4
II	4.8	4	i 1 1	-13	i 1 53	-18	—	2.0
I Rocca di Papa	5.8	291	i 1 46	+16	2 50	+11	i 3.8	6.4
II	5.8	291	1 36	+6	i 2 36	-3	—	—
I Florence	7.5	303	3 25	?S	(3 25)	+1	—	4.8
II	7.5	303	2 46	+52	—	—	—	5.3
I Vienna	8.6	344	e 2 1	-9	i 3 47	-6	i 5.0	5.8
II	8.6	344	e 2 4	-6	i 3 52	-1	i 4.5	5.4
I Innsbruck	9.6	322	e 2 22	-2	e 3 50	-28	—	6.0
II	9.6	322	e 2 21	-3	i 3 53	-25	—	—
I Lemberg	10.2	15	e 2 8	-25	e 4 56	+21	—	6.6
I Moncalieri	10.3	303	2 19	-15	5 25	+48	6.3	7.6
II	10.3	303	1 35	-59	3 26	-71	5.1	—
I Zurich	11.0	316	e 2 41	-3	i 4 50	-4	—	—
II	11.0	316	e 2 41	-3	e 4 46	-8	—	—
I Strasbourg	12.2	318	3 2	0	e 5 26	+2	e 5.8	7.1
II	12.2	318	5 0	+118	5 42	+18	—	6.7

Continued on next page.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
I Besançon	12.4	310	e 5 19	?S	(e 5 19)	-10	9.8	—
II	12.4	310	e 5 46	?S	(e 5 46)	+17	—	—
I Barcelona	13.6	288	—	—	—	—	e 8.4	10.4
I Algiers	13.7	261	—	—	—	—	—	11.8
I Helwan	13.7	134	e 3 44	+22	6 50	+49	—	11.5
I Königsberg	14.8	1	—	—	e 5 56	-31	e 7.3	8.6
I Tortosa	14.8	279	—	—	—	—	e 8.8	10.5
I Paris	15.2	311	—	—	e 7 14	+37	8.3	9.8
II	15.2	311	—	—	—	—	e 7.8	—
I Hamburg	15.2	337	e 3 37	-5	—	—	8.0	12.5
I Uccle	15.3	320	e 3 44	+1	—	—	7.8	9.8
I De Bilt	15.8	325	—	—	(e 6 50)	0	e 6.8	10.6
I Toledo	18.4	278	e 4 55	+33	—	—	e 10.8	14.1
I Granada	18.6	269	i 4 51	+27	e 8 49	+56	e 10.3	11.0
I Oxford	18.8	316	—	—	(7 50)	-8	7.8	11.2
I Stonyhurst	20.5	320	e 4 50	+3	—	—	—	13.8
I Bidston	20.6	318	5 5	+17	7 56	-40	—	14.3
I San Fernando	20.8	269	—	—	—	—	—	12.8
I Rio Tinto	20.8	272	7 50	?S	(7 50)	-50	—	17.8
I Coimbra	21.7	280	5 25	+24	i 9 23	+24	12.9	15.2
I	21.7	280	—	—	—	—	12.4	14.4
I Edinburgh	22.0	324	e 5 2	-3	—	—	e 10.8	14.7
I Bergen	22.3	341	—	—	—	—	e 11.8	—
I Dyce	22.4	328	—	—	i 9 5	-8	—	12.8
I Cape Town	73.9	181	—	—	—	—	—	42.8

Additional readings and notes: Athens gives also for I iP = +1m.54s., MN = +3.6m., T_0 = 16h.22m.28s., and for II MN = +3.4m. Mostar I iP = +1m.3s., II iP = +1m.13s. Belgrade I iP = +1m.18s., II i = +1m.13s., origin 40° 7'N, 20° 6'E. Rocca di Papa I SE = +3m.2s., II iSE = +2m.54s., Vienna I iPZ = +2m.9s., iNZ = +3m.11s., iEZ = +4m.7s., II i = +4m.5s. Moncalieri I MN = +7.8m. Strasbourg I PE = +3m.5s., MN = +6.8m. Hamburg I MNZ = +9.6m. De Bilt I MN = +10.1m., MZ = +10.2m. Stonyhurst eP increased by 1h.30m. San Fernando I MN = +13.0m. Eskdalemuir (Δ = 21° 7' Az. = 322°) gives simply 16h.

Dec. 7d. 16h. 50m. 0s. Epicentre 31° 5'N, 130° 0'E.

A = - .548, B = + .653, C = + .522 ; D = + .766, E = + .643 ;
G = - .336, H = + .400, K = - .853.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Nagasaki	1.3	356	-0 3	-23	—	—	0.0	0.1
Kobe	5.3	52	1 22	0	2 14	-11	2.6	2.9
Osaka	5.6	53	1 49	+22	—	—	3.1	4.2
Zi-ka-wei	7.3	268	2 2	+11	e 3 22	+4	—	—
Tokyo	9.1	60	i 2 52	+34	4 37	+31	—	6.0
Taihoku	9.8	231	e 3 3	+36	—	—	6.4	7.2
Mizusawa	11.8	47	2 55	-1	5 39	+25	—	—
Ootomari	18.1	29	4 23	+5	(7 44)	+2	7.7	11.3
Manila	18.8	208	e 4 49	+22	—	—	9.3	11.3
Calcutta	37.9	269	16 48	?SR ₁	—	—	—	—
Batavia	43.7	216	i 8 24	0	i 15 3	+5	30.0	—
Simla	44.7	283	18 36	?SR ₁	—	—	25.1	—
Kolombo	52.7	255	8 30	-54	21 30	?SR ₁	33.5	38.0
Kodaikanal	52.9	260	33 36	?L	—	—	(33.6)	—
Sydney	68.3	162	19 48	?S	(19 48)	-18	33.0	36.0
Königsberg	74.2	326	—	—	—	—	e 39.4	42.0
Victoria	76.8	41	—	—	—	—	46.2	47.5
Bergen	77.4	336	—	—	—	—	e 40.5	—
Hamburg	80.4	329	—	—	—	—	e 42.7	46.2
Vienna	80.6	323	i 12 24	+1	22 28	-2	e 43.0	45.5
Dyce	82.6	337	—	—	—	—	29.0	44.9
De Bilt	83.5	330	—	—	—	—	e 41.0	49.2
Innsbruck	83.8	324	—	—	—	—	e 42.0	—
Edinburgh	84.0	336	—	—	e 28 0	?SR ₁	45.0	54.4
Uccle	84.8	330	—	—	—	—	e 41.0	46.4
Strasbourg	84.8	326	—	—	—	—	e 44.5	45.2

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Stonyhurst	85.3	334	25 30	?	—	—	—	49.5
Bidston	85.8	334	41 0	?L	47 25	?	(41.0)	53.6
Florence	86.2	321	—	—	—	—	—	27.5
Kew	86.2	332	—	—	—	—	—	55.0
Besançon	86.6	326	—	—	—	—	46.0	—
Rocca di Papa	86.8	319	—	—	—	—	e 45.7	55.3
Paris	87.0	329	—	—	—	—	47.0	48.0
Moncalieri	87.3	324	37 40	?	43 4	?	45.6	48.8
Barcelona	92.7	324	—	—	—	—	e 48.7	51.2
Tortosa	93.9	325	—	—	—	—	e 49.0	54.4
Toledo	96.9	326	—	—	—	—	51.0	64.0
Coimbra	E. 98.6	329	32 41	?	41 0	?	50.0	65.7
Granada	98.8	325	—	—	43 50	?	56.5	60.5
Chicago	99.0	27	—	—	e 47 0	?L	e 56.0	—
Rio Tinto	99.8	327	54 0	?L	—	—	(54.0)	61.0
Toronto	100.2	21	—	—	—	—	52.2	—
San Fernando	E. 100.7	325	—	—	—	—	—	57.7

Additional readings and notes: Osaka gives also MN = +4.5m. Taihoku
 MN = +7.5m. Mizusawa SN = +5m.41s. Ootomari MN = +9.8m.
 Manila MN = +10.2m. Calcutta PN = +16m.52s. (?SR₁N). Batavia
 L has been increased by 10m. Hamburg e = +39m.0s., MN = +46.3m.,
 MZ = +50.1m. Vienna i = +29m.20s. (?SR₁). Uccle MN = +49.0m.
 Strasbourg ME = +49.2m. Bidston alternative P = +43m.0s. Paris
 MN = +49.0m. Moncalieri MN = +57.2m. De Bilt eSR₁ = +28m.35s.,
 eSR₂ = +32m.55s., MN = +49.0m., MZ = +54.4m. Toledo MNW =
 +62.0m. Coimbra MN = +58.8m. Toronto eL = +55.4m. San
 Fernando MN = +69.0m.

Dec. 7d. 22h. 4m. 6s. Epicentre 40°-0N. 20°-0E. (as at 16h.).

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mostar	3.7	335	i 0 55	- 3	i 1 44	+ 2	—	1.8
Pompeii	4.2	281	e 2 4	?S	(e 2 4)	+ 9	—	—
Sinj	4.5	327	e 2 4	?S	(e 2 4)	0	—	—
Belgrade	4.8	4	i 1 6	- 8	i 1 55	-16	—	2.3
Rocca di Papa	5.8	291	i 2 18	+48	—	—	—	3.2
Vienna	8.6	344	e 2 7	- 3	i 4 26	+33	e 4.9	5.4
Innsbruck	9.6	322	i 2 0	-24	i 3 51	-27	—	—
Strasbourg	N. 12.2	318	—	—	—	—	e 6.7	—
De Bilt	15.8	325	—	—	—	—	e 8.4	9.9

Mostar gives also iPS = +1m.28s.

Dec. 7d. 22h. 21m. 36s. Epicentre 31°-5N. 130°-0E. (as at 16h.50m.).

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Nagasaki	1.3	356	0 22	+ 2	—	—	0.4	—
Kobe	5.3	52	1 16	- 6	(2 29)	+ 4	2.5	3.7
Osaka	5.6	53	1 26	- 1	—	—	2.6	3.6
Zi-ka-wei	7.3	268	2 36	+45	e 3 56	+38	—	5.6
Tokyo	9.1	60	2 53	+35	e 4 43	+37	—	6.4
Manila	18.8	208	—	—	—	—	e 8.9	—
De Bilt	83.5	330	—	—	—	—	e 44.4	48.6

Additional readings: Kobe gives also MN = +2.6m. Osaka MN = +4.7m.

Dec. 7d. Readings also at 0h. and 1h. (La Paz), 5h. (near Taihoku), 6h. (Tiflis and near Nagasaki), 7h. (Zi-ka-wei, Osaka, Kobe, and near Nagasaki (6)), 8h. and 9h. (near Nagasaki), 12h. (La Paz and near Nagasaki), 13h. (2) and 14h. (near Nagasaki), 15h. (Chicago, Toronto, Victoria, and De Bilt), 16h. (Toronto and near Nagasaki (3)), 17h. (Osaka, Kobe, and near Nagasaki (5)), 18h. (Kobe and near Nagasaki (3)), 19h. (near Nagasaki (6)), 20h. (Tokyo, Kobe, Osaka, and Zi-ka-wei, and near Nagasaki (6)), 21h. (De Bilt and near Nagasaki (5)), 22h. (Kobe, Osaka, and near Nagasaki (5)), 23h. (Nagasaki).

Dec. 8d.	2h.	2m.	0s.	I	} Epicentre 31°·5N. 130°·0E. (as on 7d.)
	5h.	16m.	50s.	II	
	6h.	45m.	0s.	III	
	7h.	15m.	20s.	IV	
	13h.	39m.	0s.	V	
	20h.	19m.	50s.	VI	

A = -·548, B = +·653, C = +·522; D = +·766, E = +·643;

G = -·336, H = +·400, K = -·853.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
I	Nagasaki	1·3	356	0 9	-11	—	—	0·2	0·4
II		1·3	356	0 11	- 9	—	—	0·2	—
IV		1·3	356	-0 6	-26	—	—	0·0	—
V		1·3	356	0 51	+31	—	—	—	—
VI		1·3	356	-0 49	-69	—	—	-0·7	—
I	Kobe	5·3	52	1 23	+ 1	(2 41)	+16	2·7	3·3
II		5·3	52	e 1 31	+ 9	(2 23)	- 2	2·4	3·4
III		5·3	52	1 20	- 2	(2 23)	- 2	2·4	3·5
IV		5·3	52	1 22	0	(2 4)	+16	2·7	2·7
V		5·3	52	2 17	?S	(e 2 17)	- 8	3·6	3·6
VI		5·3	52	0 59	-23	e 1 34	-51	2·2	2·6
I	Osaka	5·6	53	1 38	+11	—	—	2·9	—
II		5·6	53	1 33	+ 6	—	—	2·8	3·9
III		5·6	53	2 10	?S	(2 10)	-24	3·4	4·7
IV		5·6	53	1 53	+26	—	—	3·1	3·4
V		5·6	53	1 39	+12	—	—	2·9	3·7
VI		5·6	53	1 25	- 2	—	—	2·6	2·8
I	Zi-ka-wei	7·3	268	2 9	+18	e 4 4	?L	(4·1)	5·9
II		7·3	268	e 2 6	+15	—	—	—	6·0
III		7·3	268	e 2 28	+37	—	—	—	5·6
IV		7·3	268	e 2 39	+48	—	—	—	—
V		7·3	268	e 2 33	+42	—	—	—	—
VI		7·3	268	e 2 18	+27	—	—	—	—
I	Tokyo	9·1	60	i 2 49	+31	i 4 8	+ 2	—	6·0
II		9·1	60	e 4 0	?S	(4 0)	- 6	(e 5·6)	7·0
III		9·1	60	e 4 6	?S	(4 6)	0	(e 6·8)	8·2
IV		9·1	60	—	—	—	—	e 7·5	—
V		9·1	60	—	—	e 3 59	- 7	—	—
VI		9·1	60	—	—	e 3 58	- 8	—	—
I	Taihoku	9·8	231	8 0	?	—	—	—	—
I	Mizusawa	E. 11·8	47	2 48	- 8	5 27	+13	—	—
I		N. 11·8	47	2 47	- 9	5 28	+14	—	—
I	Ootomari	18·1	29	4 16	- 2	—	—	8·9	—
I	Manila	18·8	208	e 4 46	+19	—	—	8·5	9·4
I	Simla	44·7	283	—	—	—	—	e 19·3	—
I	Konigsberg	74·2	326	—	—	e 35 0	?	e 40·5	47·0
I	Bergen	77·4	336	—	—	—	—	e 42·0	—
I	Hamburg	80·4	329	—	—	—	—	e 42·0	51·0
I	Vienna	80·6	323	12 24	+ 1	e 23 0	+30	e 44·0	53·0
I	Dyce	82·6	337	—	—	—	—	44·8	50·2
I	De Bilt	83·5	330	—	—	—	—	e 42·0	48·9
II		83·5	330	—	—	—	—	e 44·2	48·6
III		83·5	330	—	—	—	—	e 48·0	—
I	Uccle	84·8	330	—	—	—	—	e 42·0	—
I	Strasbourg	E. 84·8	326	—	—	—	—	e 46·6	—
I	Bidston	85·8	334	—	—	50 27	?L	(50·4)	59·0
I	Florence	86·2	321	—	—	—	—	48·5	—
I	Kew	86·2	332	—	—	—	—	—	58·0
I	Oxford	86·5	332	—	—	—	—	46·1	56·7
I	Rocca di Papa	86·8	319	—	—	—	—	e 36·3	55·6
I	Moncalieri	87·3	324	—	—	e 43 30	?L	47·3	48·9
I	Coimbra	E. 98·6	329	—	—	e 28 30	?	e 50·0	—
I		N. 98·6	329	—	—	e 34 30	?	53·5	—

Additional readings and notes to Shock 1: Kobe gives also S = +1m.59s.,
 MN = +2·8m. Zi-ka-wei MN = +5·3m. Tokyo MN = +6·2m.
 Manila MN = +8·7m. Hamburg MN = +46·4m., MZ = +51·5m.
 Eskdalemuir (Δ = 84·4) gives simply 2h. De Bilt MZ = +54·3m.
 Coimbra LE = +56·5m.

Dec. 8d. 8h. 8m. 40s. Epicentre $15^{\circ}5N$. $77^{\circ}5W$. (as on 1914 Aug. 3d.).

A = +209, B = -941, C = +267; D = -976, E = -216;
G = +058, H = -261, K = -964.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Balboa Hts.E.	6.8	198	1 54	+10	3 2	-3	3.6	3.3
N.	6.8	198	1 54	+10	2 54	-11	3.5	3.4
Merida	12.8	297	3 3	-7	—	—	6.6	7.6
Tacubaya E.	21.1	284	4 54	0	(8 28)	-18	8.5	—
Toronto	28.2	357	—	—	—	—	20.1	—
La Paz	33.3	164	7 5	-6	—	—	—	—
Victoria	49.8	322	—	—	—	—	30.8	35.5
Coimbra	64.2	53	—	—	e 22 20	?S _R	e 35.3	—
De Bilt N.	73.3	40	—	—	—	—	e 36.3	—

Additional readings: Merida gives also MN = -7.5m.
+4m.53s. De Bilt eLE = -41.3m.

Tacubaya PN =

1922. Dec. 8d. 22h. 33m. 10s. Epicentre $41^{\circ}9N$. $142^{\circ}1E$.
(as on 1921 Jan. 25d.).

A = -587, B = -457, C = -668; D = -614, E = -789;
G = -527, H = -410, K = -744.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
			m. s.	s.	m. s.	s.	m.	m.
Sapporo	1.3	335	0 41	+21	—	—	0.9	—
Mizusawa E.	2.9	195	0 42	-3	1 7	-13	—	—
N.	2.9	195	0 43	-2	1 8	-12	—	—
Ootomari	4.8	5	1 32	+18	—	—	2.5	4.1
Tokyo	6.5	197	1 1 34	+5	i 2 40	-17	—	—
Osaka	8.9	218	2 16	+1	—	—	4.4	5.5
Kobe	9.0	219	2 11	-5	(4 6)	+3	4.1	5.4
Zi-ka-wei	19.7	244	4 32	-5	8 6	-11	—	11.5
Hong Kong	30.5	238	6 12	-21	(11 8)	-35	11.1	—
Manila	32.9	221	e 6 45	-11	—	—	—	—
Simla E.	52.0	280	e 9 20	0	—	—	—	—
Batavia	57.8	223	e 9 55	-3	—	—	—	—
Victoria	62.6	49	10 53	-24	19 6	+10	30.4	34.4
Berkeley	69.3	59	e 11 25	+12	e 20 16	-2	e 32.4	—
Konigsberg	71.2	330	11 29	-5	21 35	+55	e 37.8	44.8
Bergen	71.8	340	e 11 10	-18	e 20 50	+2	—	46.8
Hamburg	76.1	334	i 11 59	+3	e 22 8	+30	e 37.8	47.7
Dyce N.	76.4	342	i 21 53	?S	(i 21 53)	+11	40.3	43.7
Edinburgh	77.9	341	—	—	e 21 50	-9	—	44.8
Vienna	77.9	327	e 12 8	+2	22 37	+38	43.8	49.8
Belgrade	78.8	322	e 12 14	+2	e 22 12	+2	e 47.3	53.0
De Bilt	78.9	335	i 12 13	+1	22 14	+3	e 36.8	47.9
Stonhurst	79.5	340	e 19 20	?PR ₁	—	—	—	46.5
Bidston	80.0	340	—	—	24 2?	+99	—	51.3
Uccle	80.2	335	e 12 20	0	e 22 32	+7	e 37.8	47.6
Innsbruck	80.7	329	e 12 20	-3	—	—	—	—
Strasbourg	81.0	332	e 12 22	-3	e 24 26	+111	e 46.8	48.3
Kew	81.1	338	—	—	—	—	—	56.8
Oxford	81.1	338	12 26	0	22 36	0	36.9	52.8
Zurich	81.7	330	e 12 27	-1	—	—	—	—
Paris	82.5	336	e 12 34	+1	e 23 22	-30	40.8	48.8
Besançon	82.8	331	—	—	—	—	44.8	—
Moncalieri	84.0	330	e 13 53	+71	e 23 26	+18	47.2	52.8
Helwan	84.1	306	12 38	-5	23 40	+31	52.8	—
Rocca di Papa	84.7	325	i 12 38	-8	22 38	-38	e 46.6	55.1
Chicago	85.1	35	22 58	?S	(22 58)	-22	e 49.8	—
Toronto	86.6	29	—	—	e 33 32	?	e 52.0	57.4
Tortosa N.	90.3	332	—	—	—	—	e 43.8	55.5
Toledo	92.1	335	e 13 17	-11	24 24	-12	e 39.8	57.9
Algiers	92.9	329	—	—	—	—	—	58.8
Coimbra E.	93.6	339	e 14 20	+44	24 30	-22	e 48.3	—
N.	93.6	339	e 17 20	?	—	—	e 47.3	60.9
Granada	95.0	334	i 13 20	-23	i 17 21	?	—	—
Rio Tinto	95.4	336	52 50	?S	—	—	(52.8)	63.8
San Fernando E.	96.5	335	—	—	—	—	—	55.8
La Paz	143.7	54	19 50	[+ 4]	—	—	—	—

For Notes see next page.

NOTES TO DEC. 8d. 22h. 33m. 1^os.

Additional readings and notes: Kobe gives also MN = +4.3m. Simla eN = 22h.30m.54s. Berkeley eSZ = +20m.35s., eLZ = +32.8m. Konigsberg SN = +21m.2s. Hamburg MN = +47.9m., MZ = +48.1m. Dyce SN = +31m.23s. Vienna iPZ = +12m.9s., iN = +13m.2s. and +14m.37s. Eskdalemuir ($\Delta = 78^{\circ}.4$) gives simply 22h. Belgrade L = +53.0m. De Bilt iPRZ = +15m.16s., MN = +49.6m., MZ = +49.8m. Uccle MN = +50.4m. Strasbourg MN = +49.0m. Paris MN = +46.8m. Moncalieri MN = +54.7m. Helwan gives S as M. Chicago L = +57.8m. San Fernando MN = +53.9m.

Dec. 8d. Readings also at 0h. (De Bilt), 1h. (La Paz), 2h. (Nagasaki (2) and near Osaka), 3h. (near Nagasaki (2) and near Granada), 4h. (La Paz and near Nagasaki), 5h. (near Nagasaki (2), near Belgrade, and near Tacubaya), 7h. (Nagasaki and near Tacubaya), 8h. (near Belgrade), 12h. (near Nagasaki (2)), 13h. (La Paz and Nagasaki (2)), 14h. (Nagasaki), 15h. (La Paz and near Nagasaki), 16h. (De Bilt, Strasbourg, and near Nagasaki), 17h. (La Paz and Nagasaki), 18h. (Nagasaki), 19h. (Taihoku, De Bilt, and Nagasaki), 20h. (Nagasaki (4)), 21h. (Nagasaki (2)), 22h. (Manila), 23h. (Batavia). See also Appendix.

Dec. 9d. Readings at 0h. (Uccle), 1h. (Nagasaki), 2h. (near Taihoku and Zi-ka-wei), 3h. (Nagasaki, near Osaka, and near Belgrade), 4h. (near Osaka and Nagasaki), 7h. (Nagasaki), 8h. (Nagasaki, De Bilt, Strasbourg, and Victoria), 10h., 11h., 12h., 13h., and 14h. (Nagasaki), 15h. (La Paz and near Tokyo), 16h. (near Port au Prince and near Tokyo), 19h. (Nagasaki (2) and near Mizusawa), 20h. (Rocca di Papa and Nagasaki), 21h. (Nagasaki) 22h., (Tiflis and Nagasaki), 23h. (Florence).

Dec. 10d. Readings at 0h. (near Nagasaki and near La Paz), 2h. (Hong Kong, Manila, and near Zi-ka-wei), 3h. (Tortosa), 5h. (near Nagasaki), 6h. (near Colima), 9h. (Manila), 11h. (Apia), 16h. (Zi-ka-wei and near Nagasaki (2)), 17h. (near Nagasaki (2)), 21h. (2) and 23h. (Manila).

Dec. 11d. Readings at 1h. (near Athens), 4h. (near Nagasaki), 5h. (near Taihoku and Zi-ka-wei), 6h. (near Nagasaki), 7h. (La Paz), 11h. (near Batavia), 12h. (near Taihoku), 15h. (near Granada), 17h. (Algiers), 18h. (Nagasaki and near Batavia). See also Appendix.

Dec. 12d. Readings at 14h. and 16h. (near Nagasaki), 17h. (Zi-ka-wei, Manila, and Batavia), 20h. (Victoria and near Nagasaki (2)), 21h. and 22h. (Mizusawa).

Dec. 13d. 14h. 3m. 52s. Epicentre $24^{\circ}.5N$. $122^{\circ}.0E$.

A = - .482, B = + .772, C = + .415; D = + .848, E = + .530;
G = - .220, H = + .352, K = - .910.

	Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
	$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Taihoku	0.6	321	0 10	+ 1	—	—	0.4	0.5
Hokoto	2.5	247	0 48	+ 9	—	—	c 1.3	—
Zi-ka-wei	6.7	356	c 1 45	+ 3	e 3 7	+ 5	—	4.0
Hong Kong	7.5	255	2 8	+ 14	—	—	—	5.3
Manila	10.0	186	e 3 29	+ 59	—	—	—	—
De Bilt	85.7	327	—	—	—	—	c 47.1	—

Zi-ka-wei gives also MZ = +4.8m., MN = +4.9m.

Dec. 13d. Readings also at 0h. (Manila), 5h. (Ottawa, Manila, and Victoria), 9h. (Merida), 10h. (near La Paz), 11h. (near Taihoku), 16h. (near Batavia), 23h. (Hong Kong).

Dec. 14d. 23h. 3m. 48s. Epicentre 3°-5S. 146°-5E. (as on 1922 Jan. 1d.).

A = -·832, B = +·551, C = -·061; D = +·552, E = +·834;
G = +·050, H = -·034, K = -·998.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Sydney	30·6	172	7 18	+44	12 18	+34	17·0	18·2
Manila	31·2	308	e 6 38	- 2	—	—	—	—
Adelaide	32·3	191	—	—	i 12 0	-13	e 15·2	20·7
Melbourne	34·3	181	—	—	—	—	—	21·1
Osaka	39·6	347	8 1	+10	(14 2)	+ 2	14·0	15·0
Tokyo	39·7	353	e 7 57	+ 5	e 14 27	+25	—	15·5
Perth	40·4	221	13 57	?S	(13 57)	-16	23·7	24·8
Hong Kong	40·8	311	8 0	- 1	14 17	- 1	20·4	—
Zi-ka-wei	42·1	328	e 8 5	- 7	—	—	—	—
Wellington	45·5	150	—	—	e 15 54	+33	i 21·9	25·2
Christchurch	46·3	154	—	—	15 48	+16	23·6	27·8
Honolulu	59·7	63	e 11 42	+92	18 17	- 2	28·2	29·8
Colombo	67·3	279	22 12	?	—	—	—	—
Kodaikanal	70·1	282	20 36	?S	(20 36)	+ 9	—	—
Victoria	92·7	41	23 59	?S	(23 59)	-43	43·6	59·0
Chicago	118·5	42	—	—	e 29 52	+74	56·7	—
Hamburg	118·6	332	—	—	—	—	e 61·2	70·2
Dyce	N. 120·8	340	—	—	—	—	—	75·8
Ann Arbor	N. 120·9	40	—	—	37 54	?SR ₁	e 51·2	—
De Bilt	121·8	332	—	—	e 23 21	?	e 58·2	63·8
Edinburgh	122·3	339	—	—	—	—	e 58·2	64·2
Eskdalemuir	122·7	339	—	—	—	—	52·2	66·1
Strasbourg	122·8	328	—	—	—	—	e 65·2	—
Toronto	123·0	38	—	—	—	—	57·8	81·7
Uccle	123·0	332	e 26 12?	?S	(e 26 12?)	-180	e 58·2	—
Florence	123·6	322	61 42	?L	—	—	(61·7)	74·2
Stonyhurst	123·6	337	e 28 12	?S	(e 28 12)	-64	—	132·7
Rocca di Papa	123·8	320	e 21 12	?PR ₁	—	—	e 66·7	e 68·1
Ottawa	124·2	34	e 27 37	?S	(e 27 37)	-103	e 51·2	—
Kew	124·6	334	—	—	—	—	—	86·2
Besançon	124·6	328	—	—	—	—	68·2	—
Oxford	124·8	335	—	—	—	—	53·2	70·2
Ithaca	125·4	38	—	—	—	—	65·2	—
Cipolletti	126·9	146	66 48	?L	—	—	68·3	78·6
Washington	127·0	41	—	—	—	—	e 66·2	—
Mendoza	130·9	140	61 42	?L	—	—	68·1	76·4
Tortosa	N. 131·7	325	—	—	—	—	e 62·6	78·2
Algiers	132·7	319	23 2	?PR ₁	e 33 4	?	e 49·2	79·2
Pilar	E. 134·5	143	64 18	?L	—	—	70·9	78·2
	N. 134·5	143	64 6	?L	—	—	67·6	74·2
Toledo	134·9	328	—	—	—	—	66·2	80·0
Andalgala	E. 135·7	138	58 6	?L	—	—	64·2	69·2
Coimbra	136·9	331	—	—	e 48 5	?SR ₁	68·7	—
La Paz	140·4	124	e 19 33	[- 7]	—	—	76·4	78·7

Additional readings: Manila gives also P = +7m.51s. Adelaide eSR₁? = +13m.48s., eSR₂? = +14m.30s. Osaka MN = +16·2m. Perth PR₁ = +14m.54s., S = +19m.32s., SR₁ = +21m.24s. Wellington e = +10m.24s. and +11m.54s., iP? = +14m.54s., iS? = +19m.36s., e = +23m.6s. Christchurch PR₁ = +11m.12s., SR₁ = +18m.36s., SR₂ = +20m.36s., L₂ = +33·0m. Honolulu PR₁E = +13m.57s. Victoria S = +30m.49s. De Bilt eE = +37m.18s., eN = +37m.54s., MN = +64·4m., MZ = +71·0m. Eskdalemuir e = +30m.38s. and +37m.48s. Toronto eL = +64·3m. and +68·3m. Uccle eS = +37m.48s.? Rocca di Papa iPV = +21m.24s., eP = +21m.42s. Ottawa eS = +37m.37s., T₀ = 23h.19m.23s. Coimbra e = +34m.2s. and +59m.35s., eLE = +64·7m., LN = +73·2m.

Dec. 14d. Readings also at 2h. (La Paz and near Port au Prince), 3h. (Berkeley), 9h. (Nagasaki), 15h. (La Paz), 16h. (near Mizusawa), 17h. (near Nagasaki (3)), 18h. (near Tokyo), 19h. (near Mizusawa and Tokyo), 20h. (Tokyo), 22h. (Batavia).

Dec. 15d. Readings at 1h. (near Tokyo), 2h. (La Paz), 5h. (Nagasaki and near Tokyo (2)), 6h. and 7h. (near Tokyo), 8h. (near Tokyo), 9h. (near Tokyo), 10h. (near La Paz), 13h. (Colombo), 14h. (near Mizusawa), 16h. (near Taihoku), 19h. (near La Paz), 21h. (near Tokyo).

Dec. 16d. 10h. 39m. 40s. Epicentre $19^{\circ}5'N$. $144^{\circ}0'E$.

$A = -.763$, $B = +.554$, $C = +.334$; $D = +.588$, $E = +.809$;
 $G = -.270$, $H = +.196$, $K = -.943$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tokyo	16.6	348	e 4 47	+47	e 7 17	+ 8	—	7.5
Mizusawa	19.8	351	4 36	- 3	8 17	- 2	—	—
Manila	22.6	261	e 5 46	+34	—	—	10.3	—
Zi-ka-wei	23.5	305	5 24	+ 1	9 34	- 1	—	—
Batavia	44.7	238	—	—	i 14 51	-20	—	—
Victoria	77.3	44	—	—	—	—	—	22.4
De Bilt	N. 99.9	336	—	—	e 27 50	+115	e 54.3	59.2
La Paz	149.3	91	19 49	[- 6]	—	—	—	—

Additional readings: Mizusawa gives also SN = +8m.21s. Zi-ka-wei PMZ = +6m.17s. De Bilt cLE = +53.3m.

Dec. 16d. Readings also at 0h. (near Tacubaya), 8h. (near Zurich), 11h. (Nagasaki), 13h. (Nagasaki, Wellington, and near Tacubaya), 15h. (Merida), 18h. (Nagasaki), 20h. (near Taihoku), 23h. (La Paz).

1922. Dec. 17d. 0h. 50m. 48s. Epicentre $39^{\circ}0'N$. $73^{\circ}0'E$.

(as on 1918 Dec. 1d.).

$A = +.227$, $B = +.743$, $C = +.629$; $D = +.956$, $E = -.292$;
 $G = +.184$, $H = +.602$, $K = -.777$.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Dehra Dun	9.6	153	—	—	3 42	-36	—	—
Bombay	20.1	181	4 43	+ 1	—	—	—	—
Calcutta	E. 21.0	137	5 0	+ 7	(8 38)	- 6	8.6	—
	N. 21.0	137	5 1	+ 8	(8 40)	- 4	8.7	—
Tifis	21.6	286	e 5 33	+33	—	—	e 9.5	12.1
Kodaikanal	29.1	171	—	—	(10 12)	-67	10.2	11.0
Colombo	32.7	167	7 54	+60	10 48	-91	12.5	17.2
Helwan	35.2	268	i 6 54	-21	—	—	—	15.1
Lemberg	35.9	304	e 7 28	+ 7	e 14 54	+105	—	17.0
Konigsberg	38.1	313	e 7 37	- 2	13 22	-17	16.1	17.2
Hong Kong	38.7	105	7 46	+ 2	—	—	—	—
Belgrade	38.9	297	e 7 35	-10	e 9 37	?	—	10.2
Zi-ka-wei	39.9	85	8 6	+12	e 14 0	- 5	—	—
Upsala	40.0	321	i 7 55	0	—	—	—	18.8
Vienna	41.0	303	e 7 55	- 8	—	—	i 18.5	19.3
Pompeii	44.1	291	e 9 19	+52	—	—	—	—
Hamburg	44.3	312	e 8 26	- 2	—	—	—	24.2
Innsbruck	44.5	302	i 8 28	- 2	—	—	e 18.2	—
Rocca di Papa	N. 45.1	295	e 8 24	-10	14 12	-64	—	—
Florence	45.5	298	8 12	-25	—	—	—	20.4
Bergen	46.1	322	8 43	+ 2	15 15	-14	19.0	21.5
Zurich	46.4	301	i 8 42	- 1	—	—	—	—
Strasbourg	46.6	305	i 8 43	- 1	e 15 33	- 3	e 22.2	24.3
De Bilt	47.4	310	i 8 51	+ 1	—	—	e 19.6	20.1
Moncalieri	47.6	299	8 49	- 2	15 30	-19	19.8	21.4
Besançon	48.1	304	e 8 51?	- 4	—	—	29.2	—
Uccle	48.2	309	8 56	+ 1	—	—	e 19.6	—
Manila	48.5	101	e 9 12	+15	—	—	—	—
Paris	49.9	307	e 9 6	0	—	—	e 20.8	—
Dyce	N. 50.4	319	—	—	i 14 22	-122	i 21.4	—
Kew	50.8	311	—	—	—	—	—	31.2
Edinburgh	51.3	317	i 9 21	+ 9	—	—	—	24.0
Oxford	51.4	311	9 7	- 9	i 16 30	- 6	—	—
Stonyhurst	51.4	313	e 9 12	- 4	—	—	—	22.7
Algiers	53.9	290	e 9 29	- 3	e 17 41	+33	24.2	—

Continued on next page.

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Tortosa	N.	54.3	298	i 9 33	- 2	16 56	-17	—	—
Batavia	E.	54.9	136	e 10 21	+43	i 20 7	+167	—	—
Toledo		57.5	299	9 59	+ 3	19 3	+70	—	—
Granada		58.4	295	e 10 5	+ 4	i 20 16	+132	—	—
Coimbra		60.4	299	10 22	+ 7	19 42	+74	27.5	—
Cape Town		88.6	222	—	—	—	—	—	23.2
Ottawa	E.	91.0	339	—	—	e 23 34	-50	e 38.7	—
Victoria		91.4	10	—	—	(25 27)	+59	25.4	26.9
Toronto		93.7	340	—	—	—	—	50.2	—
Ann Arbor		96.0	343	—	—	e 24 6	-70	e 34.7	—
Washington		97.3	336	—	—	e 24 12	-77	—	—
Chicago		97.4	346	e 13 47	- 9	—	—	e 42.2	—
La Paz		139.4	293	e 19 33	[+ 5]	—	—	—	—

Additional readings and notes: Simla ($\Delta = 8^{\circ}.6$, Az = 156°), gives PE = 0h.35m.24s., PN = 0h.35m.18s., LEN = 0h.36m.36s. Tiflis gives also e = +5m.42s., i = +5m.49s., e = +6m.28s., i = +6m.38s. Königsberg iPE = +7m.38s., iPE = +9m.11s. and +10m.7s., SE = +14m.28s., LNZ = +16.2m. Belgrade PR₁ = +8m.19s. Upsala iPR₂E = +10m.28s., SR₁ = +17m.15s. Vienna iPZ = +8m.1s., i = +9m.41s., +10m.33s., +10m.37s., +10m.46s., and +17m.49s. Hamburg iPZ = +8m.29s., ePE = +8m.30s., PR₂ = +10m.50s., PR₃ = +11m.20s., SR₁E = +18m.32s., MZ = +20.1m., MN = +25.3m. Innsbruck iPNW = +8m.25s., iNE = +10m.7s. Rocca di Papa iPE = +8m.27s. Bergen PR₁ = +10m.36s. Strasbourg PR₁ = +10m.45s., e = +19m.22s., SR₂ = +20m.18s., MN = +22.6m. De Bilt iPE = +8m.53s., PR₁Z = +10m.47s. Moncalieri MN = +20.6m., all readings diminished by 6h. Dyce i = +17m.32s., i = +20m.17s. Eskdalemuir ($\Delta = 51^{\circ}.5$, Az = 316°) gives simply 0h. Coimbra S? = +14m.54s., L = +25.3m. Ottawa eE = +22m.10s.

Dec. 17d. Readings also at 0h. (near Nagasaki), 4h. and 12h. (Batavia), 13h. (Athens, Zi-ka-wei, and La Paz), 14h. (Batavia), 17h. (Colombo), 22h. (Colombo and near Osaka).

Dec. 18d. 7h. 23m. 20s. Epicentre $40^{\circ}.0$ N. $20^{\circ}.0$ E. (as on 1922 Dec. 7d.).

$$A = +.720, B = +.262, C = +.643.$$

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mostar		3.7	335	i 1 9	+11	i 1 40	- 2	—	1.8
Belgrade		4.8	4	e 1 15	+ 1	e 1 55	-16	—	2.1
Rocca di Papa	E.	5.8	291	e 2 53	?S	(e 2 53)	+14	5.6	—
	N.	5.8	291	e 2 50	?S	(e 2 50)	+11	5.5	—
Innsbruck	N.E.	9.6	322	—	—	e 4 4	-14	—	—

Mostar gives also iP = +1m.13s.

Rocca di Papa readings increased by 1h.

Dec. 18d. 12h. 34m. 48s. Epicentre $18^{\circ}.5$ N. $68^{\circ}.0$ W. (as on 1921 May 22d.).

$$A = +.355, B = -.879, C = +.317; \quad D = -.927, E = -.375;$$

$$G = +.119, H = -.294, K = -.948.$$

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Porto Rico	E.	2.5	98	0 43	+ 4	—	—	0.9	1.5
	N.	2.5	98	0 46	+ 7	—	—	1.3	1.8
Port au Prince		4.1	271	e 1 34	+30	—	—	2.4	3.3
Cheltenham	N.	21.7	341	5 4	+ 3	9 9	+10	14.3	15.0
Washington		21.9	341	6 9	+65	10 10	+67	e 14.2	—
Ithaca		25.0	345	e 5 36	- 2	9 57	- 6	e 12.2	—
Northfield		26.0	352	e 7 12	+84	—	—	e 13.5	—
Toronto		26.9	342	—	—	—	—	e 12.2	17.7
Ann Arbor		27.3	334	e 5 58	- 3	e 10 42	- 4	e 13.2	—
Ottawa		27.7	348	e 6 10	+ 5	e 10 12	-42	e 12.2	—
Chicago		28.6	329	6 12	- 2	11 2	- 8	14.0	—

Continued on next page.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Berkeley	50.8	304	e 9 10	- 2	—	—	e 28.7	35.4
Mendoza	51.4	180	16 36	?S	(16 36)	0	29.0	35.9
Victoria	53.5	317	17 7	?S	(17 7)	+ 4	29.5	37.0
Toledo	58.5	54	e 8 54	-68	—	—	—	—
Granada	58.8	56	9 52	-12	—	—	10.2	10.4
Stonyhurst	60.8	38	e 3 12	?	—	—	—	36.2
Kew	61.8	41	—	—	—	—	—	44.2
Uccle	64.7	41	—	—	—	—	—	32.2
De Bilt	65.2	40	—	—	—	—	e 33.2	40.7
Strasbourg	66.9	44	—	—	—	—	e 37.2	—
Hamburg	68.1	38	e 11 11	+ 6	—	—	e 39.2	41.2
Rocca di Papa	71.0	51	e 11 30	+ 7	—	—	—	—
Cape Town	97.4	125	—	—	—	—	—	42.1
Colombo	139.3	50	95 12	?L	—	—	(95.2)	100.2
Manila	145.8	344	19 52	[- 2]	—	—	—	—

Additional readings: Port au Prince MNW = +3.2m. Cheltenham LE = +20.6m., T_0 = 12h.34m.45s. Washington L = 15.2m. Ithaca L = +12.7m., +17.2m. and +19.2m. Toronto iL = +14.4m., L = +16.9m., eL = +24.0m. Ann Arbor LN = +16.6m. Ottawa e = 12h.27m.41s. De Bilt MN = +38.7m. Rocca di Papa eN = +9m.48s., PR₁ = +11m.36s. Cape Town reading is increased by 1h.

Dec. 18d. 22h. 29m. 0s. Epicentre 33°.5N. 131°.9E. (as on 1921 Jan. 21d.).

$$A = -.557, B = +.621, C = +.552.$$

	Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Kobe	2.9	0 46	+ 1	1 14	- 6	1.8	3.4
Tokyo	6.8	i 1 14	-30	i 2 18	-47	—	2.3
Zi-ka-wei	9.2	e 2 22	+ 3	e 4 42	?L (e 4.7)	—	—
Simla	45.8	e 11 54	?PR ₁	—	—	—	—

Kobe gives also MN = +3.6m.

Dec. 18d. Readings also at 2h. (Azores), 8h. (Tiflis), 10h. (La Paz), 15h. (near Athens), 19h. (La Paz), 21h. (Victoria, Chicago, Berkeley, Lick, and Ottawa), 22h. (Simla (2)), 23h. (Batavia and Colombo).

Dec. 19d. 3h. 0m. 30s. Epicentre 27°.5S. 72°.8W. (as on 1922 Nov. 7d.).

$$A = +.262, B = -.847, C = -.462; \quad D = -.955, E = -.296; \\ G = -.137, H = +.441, K = -.887.$$

But see alternative solution below.

	Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Andalgala	E. 5.8	93	0 6	-84	—	—	0.9	1.4
	N. 5.8	93	0 6	-84	—	—	0.5	0.7
Mendoza	6.6	146	-1 6	?	—	—	-0.5	0.3
La Quiaca	E. 8.4	52	—	—	—	—	5.1	5.5
Pilar	E. 8.8	121	1 0	-73	—	—	1.7	2.8
	N. 8.8	121	1 54	-19	—	—	2.5	3.4
La Paz	11.8	22	2 56	0	5 10	- 4	6.1	8.0
Cipolletti	12.1	162	(3 24)	+24	—	—	3.4	4.5
Chacarita	E. 14.2	123	5 36	?S	(5 36)	-37	6.2	6.6
	N. 14.2	123	5 30	?S	(5 30)	-43	6.2	6.9

No additional readings.

In the above solution T_0 is deduced from the La Paz observations; but the consistent observations at Mendoza indicate a much earlier T_0 , unless they are in error. Accepting Mendoza as approximately correct, it seems possible that the La Paz S should be increased by 1min., or T_0 diminished by 70sec., and the epicentre must be close to Mendoza. Taking it actually at Mendoza the solution would stand thus:—

Dec. 19d. 2h. 59m. 20s. Epicentre $32^{\circ}\cdot9\text{S}$. $68^{\circ}\cdot3\text{W}$.

$$A = +\cdot310, B = -\cdot780, C = -\cdot543.$$

		Δ °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Mendoza		0·0	0 4	+ 4	—	—	0·7	1·5
Pilar	E.	4·0	2 10	?S	(2 10)	+20	2·9	4·0
	N.	4·0	3 4	?	—	—	3·7	4·6
Andalgala	E.	6·0	1 16	-16	—	—	2·1	2·6
	N.	6·0	1 16	-16	—	—	1·7	1·9
Cipolletti		6·1	—	—	—	—	4·6	5·7
Chacarita	E.	8·4	6 46	?	—	—	7·4	7·8
	N.	8·4	6 40	?	—	—	7·4	8·1
La Quiaca	E.	11·0	—	—	—	—	6·3	6·7
La Paz		16·4	4 6	+ 9	6 20	-44	7·3	9·2

The former solution seems preferable. An additional reason for not altering the La Paz readings is that they are sensibly repeated on Dec. 23d. 17h., when the other observatories are even more erratic. We may compare also Dec. 28d. 12h., which may possibly have the same epicentre. Possibly there is some misunderstanding about the time determinations?

Dec. 19d. Readings also at 7h. (La Paz), 8h. (Batavia), 9h. (near Tokyo), 11h. (Colombo), 14h. (La Paz), 16h. (Colombo and Athens), 17h. (Zi-ka-wei), 18h. (Chicago, De Bilt, Honolulu, Berkeley, Victoria, Ottawa, Lick, Toronto, and near Athens), 21h. (Colombo, near Nagasaki, and near Belgrade and Mostar), 23h. (Athens).

Dec. 20d. Readings at 1h. (near Athens), 8h. (Colombo), 9h., 11h. (3), and 12h. (3) (near Athens), 13h. (near Nagasaki and near Athens), 14h. (near Athens), 15h. (Zi-ka-wei, Colombo, and Hong Kong), 16h. (De Bilt), 19h. (near Manila).

Dec. 21d. Readings at 1h. (near Nagasaki), 2h. (near Belgrade), 5h. (La Paz), 7h. (Merida, Vera Cruz, and Tacubaya), 9h. (La Paz), 10h. (near Tacubaya (2)), 11h. (Batavia and Vera Cruz), 14h. (Manila (2)), 17h. and 18h. (2) (near Nagasaki), 19h. (La Paz), 23h. (Wellington and near Lick and Berkeley).

Dec. 22d. Readings at 0h. (Wellington), 1h. (Vera Cruz, Wellington (2), and La Paz), 4h. (near Tokyo), 9h. (near Port au Prince and near Nagasaki), 15h. (near Tacubaya), 17h. (near Manila), 23h. (Zi-ka-wei, Hong Kong, and Manila). See also Appendix.

Dec. 23d. 17h. 22m. 24s. Epicentre $27^{\circ}\cdot5\text{S}$. $72^{\circ}\cdot8\text{W}$. (as on 1922 Dec. 19d.).

$$A = +\cdot262, B = -\cdot847, C = -\cdot462; \quad D = -\cdot955, E = -\cdot296; \\ G = -\cdot137, H = +\cdot441, K = -\cdot887.$$

(See note at end.)

		Δ °	Az. °	P. m. s.	O-C. s.	S. m. s.	O-C. s.	L. m.	M. m.
Andalgala	E.	5·8	93	1 48	+18	—	—	3·0	3·5
	N.	5·8	93	1 36	+ 6	—	—	2·3	3·2
Mendoza		6·6	146	0 42	-59	—	—	1·8	2·7
La Quiaca	E.	8·4	52	0 48	-79	—	—	2·9	3·6
	N.	8·4	52	0 24	-103	—	—	3·1	3·8
Pilar		8·8	121	2 6	- 7	(4 12)	+14	4·2	5·5
La Paz		11·8	22	1 2 58	+ 2	1 5 13	- 1	6·2	6·8
Cipolletti		12·1	162	4 36	+96	(5 6)	-15	5·1	6·5
Chacarita	E.	14·2	123	6 42	?S	(6 42)	+29	9·0	9·6
Stonyhurst		101·4	36	—	—	—	—	—	60·6
De Bilt		104·5	40	—	—	—	e	52·6	—
Strasbourg		104·5	43	—	—	—	e	60·6	—

Andalgala readings have been increased by 3min. to avoid large negative residuals; Mendoza and La Quiaca also seem to require some increase. But see note to Dec. 19; the readings at the South American Stations are generally erratic.

Dec. 23d. 21h. 54m. 30s. Epicentre $19^{\circ}08'S$, $173^{\circ}0'W$. (as on 1921 Feb. 27d.).

A = -·939, B = -·115, C = -·326 ; D = -·122, E = +·993 ;
G = +·323, H = +·040, K = -·946.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Apia		5·3	13	1 20	- 2	2 35	+10	3·4	4·2
Wellington		24·6	202	—	—	e 9 42	-13	e 12·7	—
Sydney		35·1	237	8 12	+58	12 42	-15	16·1	20·0
Honolulu	E.	42·9	21	—	—	—	—	e 20·6	—
Adelaide		45·5	240	—	—	—	—	e 20·5	30·0
Perth		64·5	244	32 9	?L	37 42	?	42·0	42·9
Manila		73·2	293	—	—	e 22 30?	+86	—	—
Berkeley	N.	74·2	40	—	—	—	—	e 33·2	—
Lick	E.	74·3	40	—	—	—	—	e 38·6	—
Batavia		78·7	269	e 13 8	+57	e 22 8	0	—	—
Victoria		80·7	30	23 22	?S	(23 22)	+51	41·1	44·2
Cipolletti		89·2	132	43 0	?L	—	—	49·6	54·5
Mendoza		91·4	126	23 24	?S	(23 24)	-64	44·5	56·4
Andalgala	N.	95·2	121	44 54	?L	—	—	(44·9)	52·8
Pilar	E.	95·3	126	48 36	?L	—	—	54·5	58·5
La Paz		98·0	112	e 18 19	?PR ₁	e 28 49	?	47·7	51·1
Chicago		99·2	49	26 0	?S	(26 0)	+12	52·5	—
Toronto		105·5	49	—	—	—	—	57·1	64·8
Ottawa		108·4	47	—	—	—	—	e 55·5	—
Kodaikanal		111·6	274	67 18	?L	—	—	(67·3)	—
Stonyhurst		144·5	12	—	—	—	—	—	90·0
Hamburg		145·3	358	i 20 14	[+25]	—	—	—	—
De Bilt		146·5	2	—	—	—	—	e 86·5	—
Kew		147·1	10	—	—	—	—	—	97·5
Uccle		148·1	4	—	—	—	—	—	87·5
Strasbourg		150·4	359	—	—	—	—	e 93·5	—

Additional readings : Wellington gives also e - +11m.48s., +13m.18s., and +13m.48s., eE = +23m.20s., eN = +23m.45s. and +30m.50s. Adelaide e = +24m.30s. Chicago S? = +34m.25s. Toronto eL = +59·7m. Ottawa eL = +59·5m. Eskdalemuir ($\Delta = 142^{\circ}9'$) gives simply 23h.

Dec. 23d. Readings also at 1h. (near Tacubaya), 6h. (Pilar, Mendoza, Cipolletti, Andalgala, and La Paz), 10h. (Wellington), 12h. (Colombo), 13h. (near Sapporo and Mizusawa), 14h. (Wellington), 17h. (Batavia (2)), 18h. (near Tacubaya (2)), 19h. (Batavia), 20h. (La Paz), 23h. (Batavia (2)). See also Appendix.

Dec. 24d. 0h. 6m. 26s. Epicentre $21^{\circ}0'N$, $97^{\circ}0'E$.

A = -·114, B = +·927, C = +·358 ; D = +·993, E = +·122 ;
G = -·044, H = +·356, K = -·934.

		Δ	Az.	P.	O - C.	S.	O - C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Calcutta	E.	8·2	282	2 10	+ 6	3 48	+ 6	5·4	—
	N.	8·2	282	2 13	+ 9	3 45	+ 3	5·3	—
Hong Kong		16·0	82	—	—	—	—	—	9·6
Manila		23·7	102	e 9 38	?S	(e 9 38)	0	—	—
Zi-ka-wei		24·1	60	e 5 15	-14	e 9 39	- 7	—	13·5
Batavia		28·8	159	—	—	e 11 14	+ 1	i 15·6	—
Tokyo		40·0	59	—	—	e 13 26	-41	—	—
De Bilt	E.	74·7	320	—	—	—	—	e 43·6	—

De Bilt gives also eLN = +41·6m.

Dec. 24d. Readings also at 2h. (near Kobe), 5h. (Tokyo), 6h. (Colombo), 7h. (Lick and near Tacubaya), 8h. (near Nagasaki), 12h. (Colombo), 17h. (Chicago and Victoria), 19h. (De Bilt and La Paz), 21h. (Christchurch (2) and La Paz). See also Appendix.

Dec. 25d. 3h. 33m. 0s. Epicentre 43° 0S. 173° 0E.

A = -·726, B = +·089, C = -·682 ; D = +·122, E = +·993 ;
G = +·677, H = -·083, K = -·731.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Christchurch	0·6	209	0 0	- 9	—	—	—	—
Wellington	2·2	37	i 0 36	+ 2	i 1 0	0	—	2·0
Riverview	19·3	291	i 4 35	+ 2	i 8 11	+ 3	e 9·1	10·1
Sydney	19·3	291	4 24	- 9	—	—	9·2	11·2
Melbourne	21·9	274	4 18	-46	9 0	- 3	11·1	13·6
Adelaide	27·8	275	—	—	i 10 48	- 7	e 14·2	17·5
Apia	32·0	29	—	—	—	—	—	16·0
Perth	45·8	267	15 15	?S	(15 15)	-10	36·0	—
Batavia	68·4	281	i 11 20	+13	i 20 15	+ 8	36·2	—
Manila	74·7	309	e 12 0	+13	—	—	—	—
Cipolletti	81·2	137	37 6	?	—	—	43·5	47·9
Hong Kong	84·8	309	15 40	?PR ₁	23 3	-14	—	53·0
Mendoza	85·6	133	17 54	?	—	—	39·0	51·3
Zi-ka-wei	88·0	320	13 0	- 5	e 23 15	-37	—	46·2
Pilar	89·0	135	24 30	?S	(24 30)	+27	49·4	51·3
	89·0	135	24 24	?S	(24 24)	+21	48·3	51·0
Andalgala	90·8	132	20 54	?	—	—	42·0	43·2
Colombo	96·9	273	24 36	?S	(24 36)	-49	48·0	68·0
La Paz	98·3	123	e 17 7	?	26 37	+58	46·8	67·9
Kodaikanal	101·0	275	—	—	—	—	58·0	62·1
Victoria	107·1	38	50 58	?L	—	—	54·7	56·7
Chicago	122·9	60	e 37 25	?SR ₁	—	—	59·0	—
Toronto	129·1	62	—	—	—	—	67·6	74·8
Ottawa	132·2	61	—	—	—	—	e 64·4	—
Hamburg	164·6	319	—	—	—	—	e 88·0	96·0
Rocca di Papa	165·4	272	—	—	—	—	e 100·3	115·9
Edinburgh	166·9	351	—	—	—	—	e 95·0	114·0
De Bilt	167·8	322	i 20 14	{0}	—	—	e 78·0	98·3
Stonyhurst	168·7	346	—	—	—	—	—	97·5
Uccle	169·0	319	—	—	i 32 2	?	e 79·0	93·0
Moncalieri	169·2	286	—	—	—	—	95·8	99·3
Algiers	170·1	234	—	—	e 42 21	?SR ₁	e 89·0	97·0
Kew	170·4	334	—	—	—	—	—	106·0
Oxford	170·4	340	—	—	—	—	91·3	97·4
San Fernando	173·4	185	—	—	—	—	—	102·4
Granada	173·6	206	20 37	[+21]	—	—	20·9	21·1
Tortosa	174·0	251	—	—	—	—	e 82·0	97·3
Toledo	176·1	215	—	—	—	—	93·0	95·0
Coimbra	177·0	159	32 10	?	47 40	?SR ₁	e 84·0	98·2
	177·0	159	e 37 10	?	i 48 10	?SR ₁	e 90·0	100·7

Additional readings and notes: Riverview gives also PR₁ = +4m.51s., PS = +8m.35s., and +8m.46s., MZ = +11·2m., T₀ = 4h.32m.57s. Melbourne PR₁ = +4m.48s., SR₁ = +10m.0s. Adelaide ePR₁? = +6m.0s., eSR₁? = +13m.12s., e = +15m.0s. Perth PR₂ = +19m.19s., S = +24m.10s., SR₁ = +28m.52s., SR₂ = +31m.53s. Batavia i = +21m.9s. Zi-ka-wei PR₁Z = +16m.39s., PSZ = +24m.48s. Andalgala MN = +44·1m. Colombo S = +32m.0s. Toronto eL = +70·3m., +89·3m., and +100·4m. Ottawa eE = +32m.0s. and +38m.0s. Hamburg MZ = +101·0m. Eskdalemuir (Δ = 167°·4, Az. = 350°) gives simply 5h. De Bilt e = +36m.0s. and +52m.4s., MZ = +96·8m., MN = +97·2m. Uccle e = +50·0m. San Fernando MN = +103·2m. Coimbra LE = +88·2m.

Dec. 25d. Readings also at 0h. (near Algiers), 1h. (Granada), 2h. (Manila and near Colima), 3h. (Granada), 10h. (Colombo and La Paz), 11h. (La Paz), 12h. (Colombo (2)), 14h. (Ottawa), 20h. (Colombo), 21h. (Christchurch), 23h. (Zi-ka-wei). See also Appendix.

Dec. 26d. Readings at 2h. (Tacubaya (2)), 4h. (near Mizusawa), 6h. (near Tokyo, Sapporo, and Mizusawa), 7h. and 8h. (near Tokyo), 9h. (near Batavia), 13h. (near Tokyo), 14h. (near Tacubaya), 15h. (Colombo and La Paz), 16h. (Colombo, La Paz, and near Nagasaki), 18h. (Colombo and near Algiers), 23h. (La Paz).

Dec. 27d. 9h. 31m. 0s. Epicentre $35^{\circ}5'N$. $140^{\circ}0'E$.

$$A = -.624, B = +.523, C = +.581.$$

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Tokyo		0.3	i 0 7	+ 2	i 0 11	+ 3	—	0.3
Mizusawa	E.	3.7	0 52	- 6	1 35	- 7	—	—
	N.	3.7	0 54	- 4	1 36	- 6	—	—
Osaka		3.8	0 59	0	—	—	2.0	2.7
Kobe		4.1	e 1 13	+ 9	1 59	+ 6	2.4	3.6

Additional readings: Osaka gives also MN = +2.5m. Kobe MN = +2.4m.

Dec. 27d. Readings also at 2h. (Zi-ka-wei), 3h. (near Porto Rico, Port au Prince, and near Tokyo), 10h. (La Paz), 12h. (near Tokyo), 13h. (near Nagasaki), 16h. (Apia and La Paz), 17h. (Algiers), 20h. (Zi-ka-wei, Manila, and Hong Kong). See also Appendix.

Dec. 28d. 12h. 40m. 42s. Epicentre $29^{\circ}0'S$. $71^{\circ}0'W$. (as on 1922 Nov. 26d.).

$$A = +.285, B = -.827, C = -.485; \quad D = -.946, E = -.326;$$

$$G = -.158, H = +.458, K = -.875.$$

The reappearance of this shock at Zi-ka-wei, after feeble manifestations in North America and Europe, is noteworthy.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala	N.	4.4	73	1 18	+10	—	—	2.0	3.1
Mendoza		4.5	150	1 42	+32	—	—	2.5	3.0
Pilar	E.	6.7	115	2 12	+30	—	—	3.7	4.8
	N.	6.7	115	2 12	+30	—	—	3.6	4.2
La Quiaca	E.	8.4	36	1 42	-25	—	—	2.8	3.3
	N.	8.4	36	1 6	-61	—	—	2.5	3.1
Cipolletti		10.3	167	—	—	—	—	3.7	5.3
Chacarita	E.	12.0	121	4 48	+109	—	—	7.0	9.1
	N.	12.0	121	4 54	+115	—	—	7.0	8.1
La Paz		12.8	13	3 14	+ 4	i 5 38	- 1	i 7.0	8.2
Coimbra		90.4	42	—	—	—	—	47.3	—
Victoria		90.5	329	—	—	—	—	48.6	50.9
Toledo		92.8	45	—	—	—	—	48.3	54.1
Uccle		103.6	39	—	—	—	—	—	55.3
De Bilt	E.	104.7	39	—	—	—	e 56.3	—	—
Konigsberg		114.2	39	—	—	—	e 47.9	51.3	—
Zi-ka-wei		169.3	285	20 3	[-11]	—	—	—	98.8

Additional readings and notes: Andalgala and Mendoza readings have been increased by 4m. De Bilt gives also eLN = +57.3m. Konigsberg readings have been increased by 1h.

Dec. 28d. Readings also at 2h. (Victoria and La Paz), 9h. (Barcelona, Tortosa, Strasbourg, and Besançon), 14h. and 15h. (La Paz), 17h. (near Balboa Heights), 23h. (near Nagasaki).

Dec. 29d. 12h. 22m. 10s. Epicentre $42^{\circ}0'N$. $13^{\circ}5'E$. (as on 1918 April 18d.).

$A = +.722$, $B = +.173$, $C = +.669$; $D = +.233$, $E = -.972$;

$G = +.651$, $H = +.156$, $K = -.743$.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Rocca di Papa	0.6	247	i 0 7	- 2	—	—	e 9.8	—
Pompeii	1.5	150	i 0 19	- 4	i 0 30	-12	—	1.0
Florence	2.4	317	0 45	+ 8	—	—	—	1.8
Mostar	3.5	67	i 1 2	+ 7	i 1 43	+ 6	—	2.4
Moncalieri	5.2	308	1 19	- 1	2 22	0	—	3.2
Innsbruck	5.5	345	i 1 21	- 4	i 2 55	+24	—	3.3
Belgrade	5.8	58	e 1 22	- 8	e 2 29	-10	—	4.8
Marseilles	6.1	281	e 1 36?	+ 3	2 50?	+ 4	—	4.2
Zurich	6.4	329	e 1 33	- 5	i 3 9	+14	—	—
Vienna	6.5	17	1 33	- 6	2 33	-24	i 3.3	4.1
Besançon	7.4	317	e 1 49?	- 3	3 30	+ 9	—	3.8
Strasbourg	7.7	331	1 37	-20	3 8	-21	e 3.5	5.2
Barcelona	8.5	250	(e 2 39)	+30	—	—	e 2.6	7.3
Athens	8.9	114	e 2 5	-10	3 45	-16	e 4.2	5.5
Algiers	9.6	241	e 2 13	-11	e 4 0	-18	e 5.5	6.3
Tortosa	9.8	267	2 26	- 1	4 16	- 7	—	9.3
Paris	10.2	315	—	—	e 5 2	+27	5.8	6.9
Uccle	10.8	328	e 3 8	+27	5 37	+47	—	—
De Bilt	11.5	334	—	—	—	—	e 6.3	7.8
Hamburg	11.8	350	—	—	e 4 50	-24	—	9.4
Toledo	13.4	266	3 52	+34	7 24	+91	—	10.4
Konigsberg	13.6	16	—	—	—	—	e 6.5	9.8
Granada	14.0	255	3 46	+20	7 3	+55	9.0	10.1
San Fernando	E. 16.2	256	—	—	—	—	—	10.0
Coimbra	E. 16.6	271	4 0	0	—	—	e 10.3	11.1
	N. 16.6	271	—	—	—	—	8.9	10.7

Additional readings and notes: Mostar gives also $iP = +1m.18s.$, $MN = +2.0m.$ Belgrade $iS = +1m.44s.$, $MN = +3.5m.$ Vienna $iZ = +1m.51s.$, $i = +3m.43s.$, $iE = +3m.49s.$, $MZ = +4.2m.$, $MN = +4.3m.$ Strasbourg $MN = +5.4m.$ Athens $e = +2m.9s.$, $MN = +6.0m.$ De Bilt $MN = +8.2m.$, $MZ = +8.5m.$ Hamburg $MN = +7.4m.$, $MZ = +7.7m.$ San Fernando $MN = +9.4m.$

Dec. 29d. Readings also at 4h. (Melbourne), 9h. (Belgrade), 12h. (near Lick), 13h. (near Tokyo), 15h. (near Mizusawa and Sapporo), 21h. (near La Paz).

Dec. 30d. Readings at 7h. (Malaga (2)), 10h. (near Nagasaki), 15h. (Granada and Malaga), 19h. (Malaga).

1922. Dec. 31d. 7h. 19m. 56s. Epicentre $45^{\circ}5'N$. $151^{\circ}2'E$.

$A = -.614$, $B = +.338$, $C = +.713$; $D = +.482$, $E = +.876$;

$G = -.625$, $H = +.344$, $K = -.701$.

See note at end.

	Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
	°	°	m. s.	s.	m. s.	s.	m.	m.
Ootomari	5.8	284	0 39	-51	—	—	2.1	3.6
Sapporo	7.4	254	1 52	0	(3 22)	+ 1	3.4	—
Mizusawa	E. 9.8	233	2 32	+ 5	4 13	-10	—	—
Tokyo	13.1	225	i 3 19	+ 5	i 6 3	+17	—	10.3
Osaka	16.1	233	4 1	+ 8	(6 57)	0	7.0	13.3
Kobe	16.3	234	4 0	+ 4	7 14	+12	9.6	12.5
Zi-ka-wei	27.1	249	i 5 56	- 3	e 10 28	-15	—	17.5
Taihouku	31.4	239	—	—	e 12 32	+34	16.8	—

Continued on next page.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		°	°	m. s.	s.	m. s.	s.	m.	m.
Hong Kong		37.9	244	7 24	-13	13 14	-23	—	24.2
Manila		40.0	230	e 7 50	-5	14 46	+39	22.1	25.3
Sitka	E.	45.0	48	8 16	-17	15 2	-13	22.4	23.6
	N.	45.0	48	—	—	15 9	-6	29.6	19.4
Honolulu	E.	47.7	103	8 46	-6	i 15 45	-6	21.8	28.4
	N.	47.7	103	—	—	15 49	-1	21.9	28.7
Calcutta	E.	55.3	269	9 44	+3	—	—	—	—
Victoria		55.3	54	17 21	?S	(17 21)	-4	26.7	35.1
Simla	E.	57.7	283	9 52	-5	—	—	32.5	37.2
	N.	57.7	283	9 46	-11	—	—	32.3	—
Berkeley		61.9	65	e 10 36	+12	(e 18 49)	+2	e 26.3	30.8
Lick		62.6	65	e 19 8	?S	(e 19 8)	+12	23.7	26.6
Batavia		65.0	230	i 10 49	+4	i 19 30	+5	e 37.4	48.4
Upsala		68.0	337	e 11 15	+11	20 12	+10	e 33.5	40.8
Bombay		68.6	275	20 8	?S	(20 8)	-1	—	—
Bergen		70.5	344	—	—	e 20 1	-31	—	—
Tiflis		70.9	311	e 11 16	-6	e 20 56	+19	33.1	48.0
Kodaikanal		71.3	268	10 34	-51	—	—	39.3	48.3
Konigsberg	E.	71.3	333	11 29	+4	21 36	+54	e 35.1	44.1
	N.	71.3	333	—	—	21 46	+64	—	46.1
Lemberg		74.2	327	—	—	e 21 22	-6	—	46.9
Dyce	N.	74.9	346	11 55	+7	21 25	0	36.0	45.7
Hamburg		75.6	338	e 11 55	+2	e 21 41	-8	e 36.7	45.9
Edinburgh		76.3	345	—	—	e 22 4	-23	—	47.2
Eskdalemuir		76.9	346	e 12 2	+2	i 21 50	+2	36.1	47.2
De Bilt		78.1	340	12 9	+1	22 9	-8	e 36.1	44.6
Stonyhurst		78.1	345	e 12 4	-4	i 22 4	-3	41.6	50.8
Chicago		78.2	41	22 1	?S	(22 1)	-1	30.4	—
Vienna		78.3	331	e 12 10	+1	22 5	+1	e 41.1	49.1
Bidston		78.7	345	35 4	?	42 4	?L	(42.1)	59.1
Sydney		79.3	180	22 4	?S	(22 4)	-11	43.6	45.3
Uccle		79.5	340	e 12 17	+1	e 22 17	-1	e 37.1	47.2
Ann Arbor		79.5	38	—	—	22 22	+4	40.1	—
Belgrade		79.8	326	i 12 19	+1	e 22 12	-9	e 32.4	—
Oxford		79.9	344	—	—	—	—	31.1	50.5
Kew		80.0	343	22 4	?S	(22 4)	-19	—	50.1
Ottawa	E.	80.1	30	e 11 49	-31	22 19	-5	e 33.1	50.1
Toronto		80.2	35	—	—	i 22 34	+9	e 44.8	60.0
Strasbourg		80.7	337	—	—	—	—	e 44.1?	49.1
Innsbruck		80.7	334	i 12 28	+5	e 22 28	-3	e 41.1	53.2
Adelaide		81.3	191	—	—	i 22 34	-4	e 46.7	55.6
Zurich		81.5	335	12 22	-6	22 28	-13	—	—
Paris		81.8	341	—	—	e 22 23	-21	44.1	55.1
Northfield		82.3	29	—	—	—	—	e 45.1	—
Besançon		82.4	337	—	—	—	—	42.1	—
Ithaca		82.4	33	—	—	—	—	46.1	—
Melbourne		83.4	185	—	—	i 23 4	+3	42.5	55.1
Moncalieri		83.9	335	20 1	?	(i 23 22)	+14	41.4	50.2
Florence		83.9	332	24 59	?	—	—	—	55.3
Athens		84.2	321	e 12 38	-5	23 2	-8	e 41.6	47.7
Washington		85.1	36	—	—	—	—	e 43.1	—
Rocca di Papa		85.2	330	—	—	—	—	e 45.7	54.5
Pompeii		85.4	329	e 14 4	+74	23 19	-4	43.1	54.1
Cheltenham	E.	85.4	36	—	—	23 38	-15	41.8	—
Marseilles		86.2	335	—	—	e 23 36	+4	33.1	—
Helwan		78.0	311	12 59	0	(23 17)	-24	—	56.5
Barcelona		88.8	337	—	—	i 23 53	-8	e 34.1	53.6
Tortosa	N.	89.8	339	—	—	24 4	-8	46.3	59.0
Christchurch		91.1	166	—	—	—	—	45.5	57.1
Toledo		91.8	342	e 12 45	-41	24 4	-29	e 42.1	62.2
Coimbra	E.	92.4	346	—	—	24 8	-31	e 49.1	55.1
	N.	92.4	346	e 13 28	-1	—	—	e 50.6	60.2
Algiers		92.9	335	—	—	e 24 31	-13	e 46.1	58.1
Granada		94.2	341	—	—	—	—	51.1	54.6
Rio Tinto		94.4	344	26 4	?S	(26 4)	+64	—	70.1
San Fernando	E.	95.6	343	—	—	—	—	—	58.9
La Paz		136.3	60	e 19 36	[+3]	e 33 16	?	64.3	69.4
Cape Town		142.4	271	42 45	?S R ₁	—	—	—	93.8
Andalgala	N.	145.4	71	35 34	?	—	—	—	93.1
Pilar	E.	149.7	75	33 34	?	—	—	74.6	82.6
Cipolletti		150.5	91	34 46	?	—	—	76.7	98.6

For Notes see next page.

NOTES TO DEC. 31d. 7h. 19m. 56s.

Additional readings and notes : Mizusawa gives also SN = +2m.33s. Tokyo MN = +9.9m. Osaka MN = +10.0m. Kobe MN = +12.4m. Zi-ka-wei PSE = +11m.19s., PSN = +11m.33s., PSZ = +12m.24s., MN = +16.2m., MZ = +17.3m. Si k₁ SR₁E = +18m.20s., SR₂E = +18m.28s., LE = +29.1m., T₀ = 7h.19m.40s. Honolulu SR₁E = +19m.46s., SR₁N = +19m.34s., T₀ = 7h.19m.54s. Calcutta PN = +9m.47s. Victoria S = +21m.21s. Simla readings have been increased by 19m. Batavia P and S given as i, also i = +13m.9s. and +14m.32s. Upsala MN = +46.7m. Bergen readings increased by 1h. Tiflis MN = +45.4m. Hamburg SR₂ = +30m.16s., MZ = +45.7m. Eskdalemuir SR₁ = +27m.24s., MN = +51.0m. De Bilt SR₁ = +27m.48s., MN = +52.7m., MZ = +54.3m. Chicago S = +27m.12s. Vienna iPZ = +12m.11s., iPN = +12m.14s., iZ = +13m.7s. and +13m.53s., SN = +22m.9s., MZ = +54.1m. Bidston readings have been increased by 1h. Uccle SR₁ = +27m.40s., SR₂ = +31m.58s., MN = +45.6m. Ann Arbor e = +19m.46s. Belgrade LN = +49.8m., LE = +50.9m. Oxford iSR₁ = +27m.43s. Ottawa e = +15m.28s. Toronto gives 6 other L readings. Strasbourg MN = +54.0m. Adelaide eSR₁ = +30m.4s., eSR₂ = +35m.40s., e = +48m.16s., +51m.4s., and +52m.16s. Paris e = +32m.22s., MN = +54.1m. Ithaca L = +50.1m. and +55.1m. Melbourne SR₁ = +28m.28s., SR₂ = +31m.22s. Moncalieri S = +32m.36s., MN = +54.4m. Athens MN = +54.0m., T₀ = 7h.20m.6s. Washington L = +47.0m. Rocca di Papa L = +53.2m. Cheltenham eE = +22m.50s. Helwan gives its S as PR₁. Barcelona MN = +52.7m., all readings diminished by 1h. Christchurch SR₁ = +16m.28s., SR₂ = +23m.58s. Toledo MNW = +62.0m. San Fernando MN = +62.3m. La Paz PR₁E = +23m.10s. Pilar PN = +43m.34s. (?SR₁).

NOTE ON 1922 DEC. 31d. 7h.

The material is here sufficient to give a good determination of the epicentre. Arranging the observatories according to azimuth and omitting a few obviously discordant readings, we get the following groups showing apparent corrections to the Δ for each station.

Az.	$\delta\Delta$	Az.	$\delta\Delta$	Az.	$\delta\Delta$	Az.	$\delta\Delta$	Az.	$\delta\Delta$
30	-0.5	48	-1.3	180	-1.0	233	+0.6	254	0.0
35	+0.7	54	-0.3	185	+0.1	233	0.0	268	+1.3
36	+1.3	65	+0.8	191	-0.4	234	+0.4	269	+0.4
38	+0.4	65	+1.0	225	+0.6	239	+2.1	275	-0.1
41	0.0	103	-0.5	230	+1.1	244	-1.6	283	-1.2
				230	+0.4	249	-0.5	284	(-3.3)
36	+0.4	67	-0.1	207	+0.1	239	+0.2	270	+0.1
	± 0.6		± 0.8		± 0.6		± 0.9		± 0.6
311	0.0	329	-0.4	337	+1.3	341	-1.8		
311	+0.1	231	+0.2	337	-0.7	344	-0.6		
321	-0.8	333	+0.6	338	+0.5	345	-0.1		
326	-0.3	334	+0.3	339	-0.7	346	+0.5		
327	+0.5	335	+0.3	340	0.0	346	+2.0		
		335	-1.0	340	+0.4	346	+0.2		
319	-0.1	333	0.0	338	+0.1	345	0.0		
	± 0.3		± 0.5		± 0.6		± 0.9		

The mean numerical errors for each group are also shown, and it will be seen that the average mean error is about ± 0.6 . But the solution is satisfactory in that the algebraic mean for each group is small. Apparently the epicentre is determined in azimuth as closely as the observations and tables allow. We can therefore examine the residuals for errors of tables as follows:—

Δ	δP		δS	
	No. Obs.	Mean s.	No. Obs.	Mean s.
0-20	5	+ 4	5	+ 4
21-40	3	- 4	4	+ 9
41-60	4	- 7	3	- 6
61-70	2	+12	5	+ 6
70-74.9	4	+ 4	4	- 1
75-79.9	6	0	11	+ 3
80-84.9	4	- 9	9	- 3
85-90	1	0	7	- 5

These results indicate, as has been shown before, that the corrections required to the Tables are not large; and it will need a considerable number of good solutions to determine them so as to improve the Tables with certainty. Such results are being collected as opportunity offers.

Dec. 31d. Readings also at 7h. (Malaga and near Granada), 8h. (La Paz), 11h. (Batavia, Manila, Tokyo, and Zi-ka-wei), 15h. (La Paz), 16h. (Manila), 17h. and 20h. (Nagasaki), 22h. (Nagasaki and near Tokyo).

APPENDIX.

The following is a list of the P wave times for all the shocks recorded at La Paz from one or other of the South American epicentres.

1922 NOVEMBER.

	h.	m.	s.		h.	m.	s.		h.	m.	s.
Nov. 7	23	3	11	Nov. 13	10	43	15	Nov. 17	11	5	19
11	18	12	29		17	2	27		12	45	19
	20	49	37		19	21	42		13	12	23
	21	7	57		21	22	31		19	43	41
	21	29	20	14	1	43	32	18	3	0	0
	21	44	19		2	35	27		8	20	23
	22	23	3		(5	55	27 = L)		13	38	25
	22	53	3		17	7	35		22	13	24
	23	29	27	15	6	46	8	19	15	30	29
12	(0	40	11 = S)		6	57	29		17	57	29
	1	37	5		8	19	13		19	38	59
	(7	14	39 = S)		11	15	34	20	6	18	59
	15	25	12		13	2	18		21	16	49
	17	53	32		14	2	40	21	3	49	20
	18	3	15		14	56	23	23	9	1	16
	18	22	30		18	35	26		11	56	41
13	0	54	37	16	2	22	18		18	18	31
	1	16	33		2	41	7	24	0	43	16
	4	5	7		4	47	58	26	1	58	21
	4	16	27		4	57	23		13	33	14
	4	38	21		22	36	35		14	8	51
	6	54	27		23	26	59	27	12	23	47
	7	12	9	17	1	48	29	28	17	23	2
	8	50	25		6	43	44	29	16	57	35
	9	7	31		9	34	51		21	58	33

1922 DECEMBER.

	h.	m.	s.		h.	m.	s.		h.	m.	s.
Dec. 2	0	21	20	Dec. 11	5	57	4	Dec. 23	20	50	30
	10	31	7		15	10	7	24	18	49	27
4	6	4	44		19	3	3		19	40	59
6	14	14	43		14	39	11	25	19	43	19
8	4	35	34		22	21	10	27	0	40	32
	15	10	51	23	17	25	22	28	12	43	56

The following cases, originally relegated to the notes in the above text, seem on further scrutiny to have possible solutions. Many of them are after shocks of the Chile earthquakes, for which there was scarcely sufficient information until readings from several South American observatories were received (after the M^s. had been sent to the printers). Unfortunately there seem to be a good many mistakes of whole minutes in these readings, which has made the work of solution specially laborious and uncertain. It can only be offered as a hasty and approximate collation of defective material.

1922 Oct. 7d. 16h. 7m. 0s. Epicentre 62°-0N. 155°-0W. (as on Oct. 6d.).

	△	Az.	P.	O-C.	S.	O-C.	L.
	°	°	m. s.	s.	m. s.	s.	m.
Victoria	22.3	113	(5 8)	— 1	—	—	5.1
Chicago	43.7	87	—	—	i 14 55	— 3	—
Ann Arbor	45.2	82	—	—	19 18	2SR ₁	—
Toronto	46.1	78	e 12 0	!	—	—	22.0
Ottawa	46.4	74	—	—	e 19 49	2SR ₁	e 23.0

Toronto gives also L = +13.0m., and Ottawa gives iM = +19m.55s.

Oct. 17d. 17h. 46m. 15s. Epicentre 12° -0N. 95° -0E. (as at 9h.).

A = -0.085, B = +0.974, C = +0.208.

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Calcutta	E.	12.3	330	3 29	+26	—	—	—	—
	N.	12.3	330	2 58	-5	—	—	—	—
Colombo		15.8	252	7 45	?S	(7 45)	+55	—	11.3
Hong Kong		21.0	58	8 49	?S	(8 49)	+5	—	13.8
Batavia		21.6	150	4 53	-7	—	—	—	—
Manila		25.5	83	6 57	+74	—	—	14.3	—
Zi-ka-wei		31.0	48	—	—	e 17 0	?L	—	—

The Batavia reading is for 18h.

Oct. 17d. 21h. 14m. 30s. Epicentre 12° -0N. 95° -0E., as above ?

		Δ	Az.	P.	O-C.	S.	O-C.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.
Calcutta	E.	12.3	330	2 56	-7	—	—
	N.	12.3	330	2 38	-25	—	—
Batavia		21.6	150	5 19	+19	i 10 42	+105
Manila		25.5	83	6 12	+29	—	—

1922 Nov. 7d. 17h. 2m. 18s. Epicentre 0° -7N. 117° -9E. (as on 1921 May 14d. 11h.).A = -0.468, B = +0.884, C = +0.012; D = +0.884, E = +0.468;
G = -0.006, H = +0.011, K = -1.000.

		Δ	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Batavia		14.2	e 5 5	?S	(5 58)	+14	e 14.7	—
Manila		14.2	3 24	-5	—	—	7.0	7.5
Hong Kong		21.9	8 19	?S	(8 19)	-44	—	11.2
Zi-ka-wei		30.7	e 6 25	-10	—	—	—	—

Nov. 7d. 18h. 15m. 0s. Epicentre 0° -7N. 117° -9E. (as at 17h.).

		Δ	Az.	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Batavia		13.0	238	3 20	+7	i 5 38	-6	i 6.2	7.4
Manila		14.2	12	e 6 15	?S	(6 15)	+2	11.7	—
Perth		32.7	182	(6 48)	-6	9 44	?	13.4	—
Colombo		38.4	280	—	—	14 0	+16	26.8	30.0
Adelaide		40.6	150	12 0	?	(13 54)	-21	e 13.9	18.7
Kodaikanal		41.3	286	24 30	?	—	—	(24.5)	—
Melbourne		45.9	150	—	—	14 24	-63	18.6	23.4
Sydney		46.6	141	9 47	+63	—	—	22.0	23.0

1922 Nov. 11d. 20h. 45m. 40s. Epicentre 29° -0S. 71° -0W. (as at 18h.).

		Δ	P.	O-C.	S.	O-C.	L.	M.
		$^{\circ}$	m. s.	s.	m. s.	s.	m.	m.
Pilar		6.7	2 44	?S	(2 44)	-18	3.3	3.1
La Quiaca		8.4	1 50	-17	—	—	2.8	3.8
Cipolletti		10.3	—	—	—	—	4.7	5.3
Chacarita	E.	12.0	5 38	?S	(5 38)	+19	6.5	6.9
	N.	12.0	5 20	?S	(5 20)	+1	6.2	—
La Paz		12.8	e 3 57	+47	e 5 53	+14	6.5	6.7
Stonyhurst		101.7	e 49 20	?L	—	—	(e 49.3)	—
Eskdalemuir		102.1	—	—	—	—	58.3	—
De Bilt		104.7	—	—	—	—	e 57.3	—

1922 Nov. 11d. 21h. 41m. 0s. Epicentre 29°·0S. 71°·0W. (as at 20h.).

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Pilar	6·7	3 30	?S	(3 30)	+28	4·1	4·5
La Quiaca	8·4	1 36	-31	—	—	2·5	3·0
Cipolletti	10·3	3 48	+74	—	—	4·2	6·8
La Paz	12·8	e 3 19	+ 9	e 5 24	-15	6·1	6·3
Eskdalemuir	102·1	—	—	—	—	41·9	—

Nov. 11d. 22h. 19m. 30s. Epicentre 29°·0S. 71°·0W. (as at 21h.).

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala	4·4	0 42	-26	—	—	1·4	1·7
Pilar	6·7	2 42	?S	(2 42)	-20	3·0	4·0
La Quiaca	8·4	3 30	?S	(3 30)	-17	4·7	5·0
Cipolletti	10·3	—	—	—	—	4·4	6·5
Chacarita	E. 12·0	5 54	?S	(5 54)	+35	7·8	8·2
	N. 12·0	5 12	?S	(5 12)	- 7	6·7	—
La Paz	12·8	3 33	+23	e 5 51	+12	5·9	8·0
Eskdalemuir	102·1	—	—	—	—	60·5	—
De Bilt	104·7	—	—	—	—	e 57·5	—

Nov. 12d. 15h. 21m. 29s. Epicentre 29°·0S. 71°·0W. (as on Nov. 12d. 7h., &c.).

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala	E. 4·4	0 1	-67	—	—	1·2	1·3
	N. 4·4	—	—	—	—	0·7	0·8
Mendoza	4·5	—	—	—	—	5·8	6·0
Pilar	E. 6·7	1 31	-11	—	—	4·1	4·2
	N. 6·7	—	—	—	—	3·5	4·0
La Quiaca	E. 8·4	3 1	?S	(3 1)	-46	4·0	4·5
	N. 8·4	—	—	—	—	3·8	6·0
Cipolletti	10·3	4 19	?S	(4 19)	-18	—	4·7
La Paz	12·8	3 43	+33	—	—	6·7	7·1

Nov. 12d. 17h. 50m. 30s. Epicentre 29°·0S. 71°·0W. (as at 15h., &c.).

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala	E. 4·4	—	—	—	—	0·0	0·4
	N. 4·4	-1 36	-164	—	—	-0·1	0·5
Mendoza	4·5	4 18	?	—	—	5·3	5·9
Pilar	E. 6·7	2 0	+18	—	—	4·2	4·9
	N. 6·7	2 30	+48	—	—	4·0	4·4
La Quiaca	E. 8·4	0 54	-73	—	—	2·5	2·8
	N. 8·4	2 30	+23	—	—	2·6	3·3
Cipolletti	10·3	—	—	—	—	3·5	4·5
Chacarita	E. 12·0	4 6	+67	—	—	7·2	7·4
	N. 12·0	3 48	+49	—	—	5·5	5·7
La Paz	12·8	3 2	- 8	5 42	+ 3	6·8	7·3
Eskdalemuir	102·1	—	—	—	—	59·5	—
Uccle	103·6	—	—	—	—	e 54·5	—
De Bilt	104·7	—	—	—	—	e 57·5	—

Nov. 12d. 21h. 53m. 30s. Epicentre 29°·0S. 71°·0W. (as at 17h., &c.).

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Mendoza	4·5	—	—	—	—	5·2	7·5
Pilar	E. 6·7	—	—	—	—	3·6	3·7
	N. 6·7	—	—	—	—	5·4	5·6
La Quiaca	E. 8·4	—	—	—	—	2·9	5·5
	N. 8·4	—	—	—	—	3·0	5·8
Cipolletti	10·3	6 18	?L	—	—	—	7·5
La Paz	12·8	2 59	-11	7 27	+108	10·5	11·0

Nov. 13d. 4h. 1m. 45s. Epicentre 29°·0S. 71°·0W. (as on Nov. 12d.).

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala	E.	4·4	-1 21	-149	—	—	-0·1	0·4
Mendoza		4·5	4 21	+191	—	—	5·4	5·8
Pilar	E.	6·7	4 7	+145	—	—	5·1	5·3
		6·7	4 7	+145	—	—	4·6	4·8
La Quiaca	N.	8·4	—	—	—	—	2·8	3·6
Cipolletti	E.	10·3	7 27	?S	(7 27)	+170	8·3	11·2
La Paz		12·8	3 22	+12	5 27	-12	6·5	8·5

Nov. 13d. 4h. 13m. 0s. Epicentre 29°·0S. 71°·0W. (as above).

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala	E.	4·4	-0 54	-122	—	—	0·2	0·9
Mendoza		4·5	5 6	?	—	—	5·6	6·5
Pilar	E.	6·7	—	—	—	—	5·5	5·7
	N.	6·7	—	—	—	—	5·0	5·6
La Quiaca		8·4	—	—	—	—	3·8	4·5
Cipolletti		10·3	—	—	—	—	8·3	11·2
La Paz		12·8	e 3 27	+17	—	—	6·5	8·4
Victoria		90·5	13 23	+ 4	—	—	48·1	51·1
Toledo		92·8	—	—	—	—	44·0	53·2
Eskdalemuir		102·1	—	—	—	—	44·0	—
Edinburgh		102·5	—	—	—	—	e 55·0	—
Uccle		103·6	—	—	28 6	?	e 40·0	—
De Bilt		104·7	—	—	e 47 0	?	e 52·0	—
Hamburg		108·0	—	—	—	—	e 61·0	—

Nov. 13d. 4h. 35m. 0s. Epicentre 29°·0S. 71°·0W. (as above).

		Δ °	P. m. s.	O - C. s.	L. m.	M. m.
Andalgala	E.	4·4	-0 42	-110	0·6	0·8
	N.	4·4	-0 30	-98	0·5	0·7
Mendoza		4·5	—	—	0·1	0·4
Pilar	E.	6·7	—	—	4·3	5·0
	N.	6·7	—	—	4·9	5·3
La Paz		12·8	e 3 21	+11	6·5	8·0

Nov. 13d. 7h. 8m. 45s. Epicentre 29°·0S. 71°·0W. (as at 4h.).

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala		4·4	—	—	—	—	0·4	0·8
Mendoza		4·5	—	—	—	—	5·3	5·5
Pilar	E.	6·7	5 9	?	—	—	5·6	5·8
	N.	6·7	2 45	?S	(2 45)	-17	3·4	3·7
Cipolletti		10·3	—	—	—	—	7·9	10·6
La Paz		12·8	e 3 24	+14	5 37	- 2	6·8	8·1

Nov. 13d. 8h. 51m. 0s. Epicentre 29°·0S. 71°·0W. (as at 7h.).

		Δ °	P. m. s.	O - C. s.	L. m.	M. m.
Mendoza		4·5	—	—	2·4	2·8
Pilar		6·7	1 18	-24	1·8	2·2
Cipolletti		10·3	3 0	+26	3·8	6·2

1922 Nov. 15d. 6h. 43m. 20s. Epicentre $27^{\circ}5S$. $72^{\circ}8W$. (as on Nov. 7d. 23h.).

$$A = +.262, B = -.847, C = -.462.$$

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala	E.	5.8	-0 26	-116	—	—	0.8	1.0
Mendoza		6.6	3 28	?S	(3 28)	+28	4.3	4.7
Pilar	E.	8.8	2 10	- 3	—	—	4.3	4.7
	N.	8.8	—	—	—	—	4.1	4.4
La Paz		11.8	2 48	- 8	5 28	+14	6.8	7.3
Cipolletti		12.1	—	—	—	—	3.5	4.7

Nov. 15d. 6h. 54m. 30s. Epicentre $27^{\circ}5S$. $72^{\circ}8W$. (as above).

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala	E.	5.8	0 24	-66	—	—	0.9	1.3
	N.	5.8	—	—	—	—	0.6	0.8
Mendoza		6.6	3 30	?S	(3 30)	+30	4.0	4.4
Pilar	E.	8.8	3 48	?S	(3 48)	-10	4.5	4.7
	N.	8.8	—	—	—	—	4.0	4.2
La Paz		11.8	i 2 59	+ 3	4 58	-16	6.0	7.2
Cipolletti		12.1	—	—	—	—	4.6	5.8

Nov. 15d. 8h. 16m. 20s. Epicentre $27^{\circ}5S$. $72^{\circ}8W$. (as above).

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala	E.	5.8	0 28	-62	—	—	1.7	2.0
	N.	5.8	0 34	-56	—	—	1.2	1.5
Mendoza		6.6	3 40	?S	(3 40)	+40	4.8	5.4
Pilar	E.	8.8	4 4	?S	(4 4)	+ 6	—	6.1
	N.	8.8	4 34	?S	(4 34)	+36	4.9	6.0
La Paz		11.8	e 2 53	- 3	—	—	5.8	7.2
Cipolletti		12.1	—	—	—	—	4.6	5.5

Nov. 16d. 4h. 45m. 0s. Epicentre $27^{\circ}5S$. $72^{\circ}8W$. (as above).

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala	E.	5.8	-1 12	-162	—	—	0.3	0.6
	N.	5.8	0 0	-90	—	—	0.5	0.7
Mendoza		6.6	—	—	—	—	5.8	6.8
Pilar	E.	8.8	3 48	?S	(3 48)	-10	—	4.9
	N.	8.8	3 42	?S	(3 42)	-16	4.6	4.0
La Paz		11.8	i 2 58	+ 2	5 10	- 4	6.4	6.6
Cipolletti		12.1	6 12	?S	(6 12)	+51	6.8	8.0

Nov. 17d. 19h. 38m. 30s. Epicentre $38^{\circ}0S$. $73^{\circ}5W$. (as on 1922 Mar. 12d.).

$$A = +.224, B = -.755, C = -.616.$$

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Mendoza		6.6	—	—	—	—	4.9	5.0
Pilar	E.	9.6	—	—	—	—	6.4	8.0
	N.	9.6	—	—	—	—	5.8	6.5
La Plata	E.	12.9	—	—	—	—	7.5	8.8
La Paz		22.0	e 5 11	+ 6	8 57	- 8	9.8	12.6

Nov. 20d. 21h. 13m. 40s. Epicentre 29°-0S. 71°-0W. (as on Nov. 11d.).

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Mendoza		4.5	150	3 50	?S	(3 50)	+106	4.9	6.0
Pilar		6.7	115	3 50	?S	(3 50)	+48	5.0	5.3
La Quiaca	E.	8.4	36	3 38	?S	(3 38)	- 9	4.5	4.8
	N.	8.4	36	3 44	?S	(3 44)	- 3	4.5	5.0
Cipolletti		10.3	167	—	—	—	—	6.3	7.2
Chacarita	E.	12.0	121	6 38	?S	(6 38)	+79	7.4	9.1
La Plata	E.	12.5	121	2 29	-37	—	—	5.7	6.7
	N.	12.5	121	2 46	-20	5 7	-25	5.9	8.7
La Paz		12.8	13	e 3 9	- 1	5 37	- 2	6.5	11.1

La Plata gives $T_0 = 21h.13m.12s.$ Epicentre 29°-2S. 70°-8W.

Nov. 21d. 3h. 46m. 8s. Epicentre 29°-0S. 71°-0W. (as above).

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala	E.	4.4	1 16	+ 8	—	—	2.4	2.6
Mendoza		4.5	3 10	+120	—	—	3.7	3.9
Pilar		6.7	1 52	+10	—	—	4.6	4.9
Cipolletti		10.3	4 22	?S	(4 22)	-15	5.3	5.9
Chacarita	E.	12.0	5 40	?S	(5 40)	+21	8.4	8.7
	N.	12.0	5 40	?S	(5 40)	+21	7.1	7.5
La Plata	E.	12.5	i 4 14	+68	6 42	+70	7.4	8.6
	N.	12.5	4 31	+85	6 57	+85	7.3	8.5
La Paz		12.8	e 3 12	+ 2	5 36	- 3	—	9.0
Eskdalemuir		102.1	—	—	—	—	e 43.9	—
Uccle		103.6	—	—	—	—	e 50.9	—
De Bilt	E.	104.7	—	—	—	—	e 53.9	—

The Andalgala readings have been diminished by 6min. La Plata gives $T_0 = 3h.47m.24s.$ Epicentre 28°-2S. 70°-8W. Its readings appear to be 1min. too large.

Nov. 26d. 14h. 5m. 45s. Epicentre 29°-0S. 71°-0W. (as above).

		Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala	E.	4.4	1 15	+ 7	—	—	1.9	3.2
Mendoza		4.5	1 15	+ 5	—	—	2.0	2.9
Pilar		6.7	1 27	-15	—	—	3.1	4.4
La Quiaca	E.	8.4	2 15	+ 8	—	—	3.2	4.3
	N.	8.4	1 45	-22	—	—	3.2	4.2
Cipolletti		10.3	4 39	?S	(4 39)	+ 2	5.9	7.2
Chacarita	E.	12.0	5 21	?S	(5 21)	+ 2	—	—
	N.	12.0	5 15	?S	(5 15)	- 4	6.8	8.0
La Plata	E.	12.5	i 3 16	+10	5 34	+ 2	6.3	8.6
	N.	12.5	i 3 9	+ 3	5 30	- 2	6.2	8.0
La Paz		12.8	e 3 6	- 4	5 16	-23	6.3	7.9

Andalgala gives also MN = +2.6m. All the readings have been diminished by 4m. Mendoza readings have been increased by 4m. Pilar gives also MN = +3.7m. La Plata gives $T_0 = 14h.6m.1s.$ Epicentre 27°-4S. 69°-0W. La Paz gives i = +6m.11s. $T_0 = 14h.6m.12s.$

Dec. 8d. 15h. 7m. 44s. Epicentre 27°-5S. 72°-8W. (as on Nov. 16d. 4h.).

A = +.262, B = -.847, C = -.462; D = -.955, E = -.296;
G = -.137, H = +.441, K = -.887.

		Δ °	Az. °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala		5.8	93	2 34	?S	(2 34)	- 5	3.6	4.6
La Quiaca		8.4	52	1 40	-27	—	—	4.0	4.7
Pilar		8.8	121	2 40	+27	—	—	4.5	5.6
La Paz		11.8	22	3 7	+11	5 3	-11	5.9	6.9
Cipolletti		12.1	162	—	—	—	—	8.1	11.4
Chacarita		14.2	123	6 34	?S	(6 34)	+21	7.3	8.7
La Plata	E.	14.7	124	3 41	+ 6	6 9	-16	7.2	8.3
	N.	14.7	124	3 32	- 3	5 54	-31	6.8	7.9
Stonyhurst		101.4	36	e 40 46	?L	—	—	(e 40.8)	58.3
Strasbourg		104.5	43	—	—	—	—	e 63.3	—
De Bilt	E.	104.5	40	—	—	—	—	e 52.3	—

La Quiaca gives also MN = +4.8m. Pilar LN = +4.3m., MN = +4.7m.
Chacarita LN = +7.6m., MN = +7.9m.

Dec. 11d. 5h. 52m. 48s. Epicentre $34^{\circ}08'$, $73^{\circ}00'W$. (as on 1922 Aug. 6d.).

A = +242, B = -793, C = -559.

		Δ c	Az. o	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Mendoza		4.1	74	—	—	—	—	3.6	4.2
Cipolletti		6.3	143	3 30	?S	(3 30)	+38	4.1	7.2
Pilar		8.0	76	3 0	?S	3 0	-37	3.6	4.0
Andalgala	E.	8.6	43	3 36	?S	(3 36)	-17	5.3	7.7
	N.	8.6	43	2 30	+20	—	—	4.1	4.6
Chacarita		12.1	97	3 18	+18	(5 24)	+ 3	6.1	7.6
La Plata	E.	12.5	98	3 15	+ 9	5 7	-25	6.3	7.2
	N.	12.5	98	3 12	+ 6	5 5	-27	6.3	7.0
La Paz		18.0	15	14 16	- 1	5 19	?	7.0	8.7

La Plata gives also $PR_1E? = +3m.43s.$, $PR_1N? = +3m.37s.$ Dec. 22d. 21h. 7m. 13s. Epicentre $29^{\circ}08'$, $71^{\circ}00'W$. (as on 1922 Nov. 26d.).

		Δ c	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala		4.4	1 5	- 3	—	—	1.6	2.3
Mendoza		4.5	-0 1	-71	—	—	0.6	1.1
Pilar	E.	6.7	1 59	+17	—	—	3.7	4.0
	N.	6.7	2 35	+53	—	—	3.2	3.5
La Quiaca		8.4	1 41	-26	—	—	3.1	3.4
Cipolletti		10.3	2 35	+ 1	—	—	2.8	4.8
Chacarita		12.0	5 23	?S	(5 23)	+ 4	6.8	7.4
La Plata	E.	12.5	2 29	-37	4 38	-54	5.3	6.5
	N.	12.5	2 32	-34	4 48	-44	5.9	6.6
La Paz		12.8	3 15	- 5	5 19	-20	6.4	8.2

Andalgala readings have been increased by 3min. and Chacarita readings decreased by 2min. La Quiaca gives also $MN = -3.5m.$ Dec. 23d. 9h. 11m. 40s. Epicentre $29^{\circ}08'$, $71^{\circ}00'W$. (as above).

		Δ c	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala		4.4	1 56	+48	—	—	2.7	2.8
Mendoza		4.5	0 32	-38	—	—	1.5	1.7
Pilar	E.	6.7	1 14	-28	—	—	2.2	2.4
Cipolletti		10.3	2 56	+22	—	—	3.6	4.2
La Plata	E.	12.5	3 0	- 6	5 26	- 6	6.3	8.2
	N.	12.5	3 9	- 3	5 34	- 2	6.6	7.1

Andalgala readings have been increased by 3min. and Pilar readings decreased by 2min.

Dec. 24d. 18h. 44m. 12s. Epicentre $29^{\circ}08'$, $71^{\circ}00'W$. (as above).

		Δ c	P. m. s.	O - C. s.	L. m.	M. m.
Andalgala		4.4	1 0	- 8	1.5	1.6
Mendoza		4.5	1 42	-22	2.2	2.5
Pilar	E.	6.7	1 42	0	5.8	7.0
	N.	6.7	1 48	- 6	6.2	6.7

Dec. 24d. 18h. 46m. 25s. Epicentre $29^{\circ}08'$, $71^{\circ}00'W$. (as above).

(Apparently the above shock did not register at the rather more distant stations.)

		Δ c	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
La Quiaca		8.4	4 11	?S	(4 11)	+24	4.5	5.1
Cipolletti		10.3	4 35	?S	(4 35)	- 2	6.5	7.2
Chacarita		12.0	5 47	?S	(5 47)	+28	6.2	6.6
La Plata	E.	12.5	—	—	5 48	+16	7.1	7.3
	N.	12.5	—	—	5 46	+14	7.1	7.8
La Paz		12.8	3 2	- 8	5 31	- 8	6.4	7.4
De Bilt		104.7	—	—	—	—	50.6	—

The Chacarita readings have been decreased by 2min.

Dec. 25d. 11h. 25m. 33s. Epicentre $10^{\circ}0'N$, $121^{\circ}0'E$. (as on 1917 Jan. 10d.).

$$A = -.507, B = +.848, C = +.174.$$

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Manila	4.6	e 1 27	+16	—	—	—	—
Hong Kong	13.9	—	—	—	—	—	18.4
Zi-ka-wei	21.2	5 4	+ 9	—	—	—	21.0
Batavia E.	21.5	e 4 52	- 7	—	—	—	—
Perth	42.3	—	—	—	—	21.9	—
Adelaide	48.0	e 15 27	?S	(e 15 27)	-27	—	18.0
Sydney	52.5	8 39	-44	—	—	15.3	16.7
Victoria	98.7	—	—	—	—	55.6	57.6
Chicago	121.9	—	—	—	—	e 57.4	—
Ottawa	122.5	—	—	—	—	e 55.4	—
Toronto	123.2	—	—	—	—	72.0	—

The Manila reading has been decreased by 10min.
+52m.27s.

Ottawa gives also e =

Dec. 25d. 19h. 40m. 20s. Epicentre $29^{\circ}0'S$, $71^{\circ}0'W$. (as on Dec. 23d., &c.).

	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala N.	4.4	—	—	—	—	2.9	3.2
Mendoza	4.5	1 4	- 6	—	—	2.0	2.7
Pilar	6.7	2 22	+40	(3 16)	+14	3.3	3.7
La Quiaca E.	8.4	3 52	?S	(3 52)	+ 5	4.7	6.7
Cipolletti	10.3	—	—	—	—	6.3	7.6
La Plata E.	12.5	2 45	-21	5 12	-20	6.0	6.7
N.	12.5	3 5	- 1	5 9	-23	—	6.8
La Paz	12.8	2 59	-11	5 12	-27	6.3	8.6

Andalgala readings have been increased by 4min. and Mendoza by 2min.

Dec. 27d. 0h. 37m. 26s. Epicentre $29^{\circ}0'S$, $71^{\circ}0'W$. (as above).

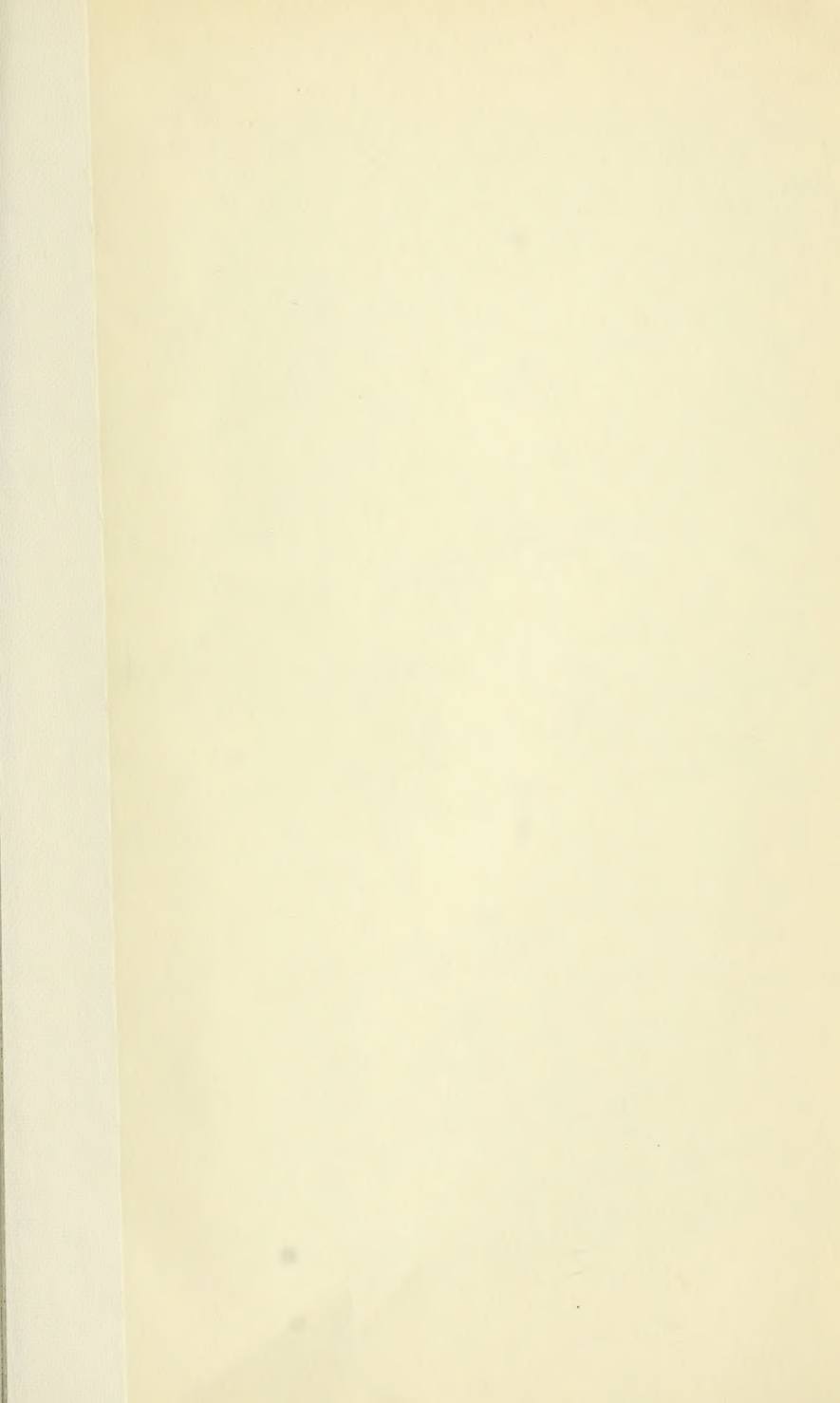
	Δ °	P. m. s.	O - C. s.	S. m. s.	O - C. s.	L. m.	M. m.
Andalgala E.	4.4	-1 50	-178	—	—	2.0	2.4
N.	4.4	1 4	- 4	—	—	1.7	2.1
Mendoza	4.5	0 58	-12	—	—	1.9	3.1
Pilar	6.7	2 4	+22	—	—	3.0	3.6
La Quiaca	8.4	—	—	—	—	3.2	3.6
Chacarita E.	12.0	5 40	?S	(5 40)	+21	6.8	6.9
N.	12.0	5 46	?S	(5 46)	+27	6.7	7.3
La Plata E.	12.5	2 39	-27	4 51	-41	5.9	7.6
N.	12.5	2 40	-26	4 42	-50	6.0	6.8
La Paz	12.8	3 6	- 4	4 5 28	-11	6.9	8.3

Andalgala readings have been increased by 4min. and Mendoza by 3min.
La Plata E = +5m.30s., N = +5m.18s.



TABLE.

De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.	De- grees.	P sec.	S sec.	S - P sec.
1	15	28	13	51	553	991	438	101	855	1565	710
2	31	55	24	52	560	1004	444	102	860	1575	715
3	47	83	36	53	566	1016	450	103	865	1584	719
4	62	110	48	54	573	1029	456	104	870	1593	723
5	77	137	60	55	579	1041	462	105	874	1602	728
6	92	164	72	56	586	1054	468	106	879	1612	733
7	106	190	84	57	592	1066	474	107	884	1621	737
8	121	217	96	58	599	1079	480	108	888	1630	742
9	136	243	107	59	605	1091	486	109	893	1639	746
10	150	269	119	60	612	1103	491	110	897	1648	751
11	164	294	130	61	619	1116	497	111	902	1657	755
12	179	319	140	62	625	1128	503	112	907	1666	759
13	193	344	151	63	632	1141	509	113	911	1674	763
14	206	368	162	64	638	1153	515	114	916	1682	766
15	219	392	173	65	645	1165	520	115	920	1690	770
16	232	415	183	66	651	1177	526	116	925	1698	773
17	245	438	193	67	658	1190	532	117	929	1706	777
18	257	460	203	68	664	1202	538	118	934	1714	780
19	269	482	213	69	671	1214	543	119	938	1722	784
20	281	503	222	70	677	1226	549	120	942	1729	787
21	293	524	231	71	683	1238	555	121	947	1737	790
22	305	545	240	72	690	1250	560	122	952	1744	792
23	317	565	248	73	696	1262	566	123	957	1752	795
24	328	584	256	74	702	1274	572	124	961	1759	798
25	338	603	265	75	709	1286	577	125	966	1766	800
26	348	622	274	76	715	1297	582	126	970	1773	803
27	358	641	283	77	721	1309	588	127	974	1780	806
28	368	659	291	78	727	1320	593	128	978	1787	809
29	378	677	299	79	733	1332	599	129	983	1794	811
30	388	694	306	80	739	1343	604	130	988	1801	813
31	398	711	313	81	745	1355	610	131	992	1807	815
32	407	728	321	82	750	1366	616	132	996	1814	818
33	416	744	328	83	756	1377	621	133	1001	1821	820
34	425	760	335	84	762	1388	626	134	1005	1827	822
35	433	775	342	85	768	1399	631	135	1009	1833	824
36	442	790	348	86	773	1410	637	136	1014	1840	826
37	450	804	354	87	779	1421	642	137	1018	1846	828
38	458	818	360	88	785	1432	647	138	1023	1852	829
39	466	832	366	89	790	1443	653	139	1027	1858	831
40	475	847	372	90	796	1454	658	140	1031	1864	833
41	483	861	378	91	801	1464	663	141	1035	1869	834
42	491	875	384	92	807	1475	668	142	1039	1875	836
43	498	888	390	93	812	1485	673	143	1043	1881	838
44	506	902	396	94	818	1496	678	144	1047	1886	839
45	513	915	402	95	823	1506	683	145	1051	1892	841
46	520	928	408	96	829	1516	687	146	1055	1897	842
47	527	941	414	97	834	1526	692	147	1059	1902	843
48	534	954	420	98	840	1536	696	148	1063	1907	844
49	540	966	426	99	845	1546	701	149	1067	1912	845
50	547	979	432	100	851	1556	705	150	1071	1917	846



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